310008 - Construction Materials I

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: JUDITH RAMIREZ CASAS
Others: JOSE ANTONIO FERNANDEZ BORRAS - JUAN CARLOS GARCÍA VÁZQUEZ - MARIA ANTONIA NAVARRO EZQUERRA - JUAN RAMON ROSELL AMIGO - JOAN FORMOSA MITJANS

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.

Transversal:
3. 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.

Teaching methodology

The directed self-learning hours consist on the one hand in teaching theoretical classes (big group) where the professor does a brief explanation for introducing the general learning objectives related with the basic concepts of the subjects. Subsequently and by means of practical exercises the professor tries to encourage and involve the students so that they take part actively in their learning. It is used support material in detailed educational plan format, by ATENEA. Learning objectives by contents, concepts, examples, evaluation activities and directed learning schedule and bibliography. On the other hand, the directed learning hours also consist on teaching problem classes (medium group) where normally the work is done in groups of 3 to 4 members, by means of the resolution of exercises and numerical problems related with the specific learning objectives of each content of the subject.

During the activities fulfilment it is pretended to incorporate some generic competences, like teamwork or effective oral communication. For that there will be developed cooperative learning techniques at class. The lab practices allow to develop basic skills of instruments kind, as well as introduce the students to the scientific method implementation in the resolution of lab problems. Generally after each session out of class tasks are proposed, the students must work individually or in group these tasks, which are the basis of the directed activities.

There also have to be considered the rest of the autonomous self-learning hours like the ones dedicated to the guided readings, the resolution of the proposed problems and the self-learning questionnaires of the different contents by virtual campus ATENEA.

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.
- Carry out a correct and backed up selection of materials in the construction sector.
- Identify and use the current law which regulates the construction materials.
- 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:</th>
<th>54h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>13h 30m</td>
<td>6.00%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>22h 30m</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>135h</td>
<td>60.00%</td>
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</tbody>
</table>
# C1: Introduction and materials properties

**Description:**
Characteristics and physical, mechanical and chemical properties of the materials. This content pretends to introduce to the student new technical language and information skills. Also is important an specific class of sustainability and environment about materials.

**Related activities:**
- Activity 0. Search information to do scientific and technical works related to the subject. (Attending in a workshop at the Library).
- Activity 1. Making a poster.
- Activity 2. Practice of sustainability and environment (Attendance to seminar).

**Learning time:** 33h
- Theory classes: 12h
- Practical classes: 1h
- Guided activities: 6h
- Self study: 14h

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# C2: Soils and stones

**Description:**
Definition, origin and different types of stones and their properties. Specific characteristics of stones related to their application. Stones more used in territory.

Definition of the different types of lands, classify and identify. Analysis of their properties and characteristics from the tests and their results.

How they are interpreted Geotechnical studies (CTE).

Ecological and environmental characteristics of rocks and lands.

Regulations of reference.

**Related activities:**
- Activity 3. The class will be divided in two groups. The first part will do a geotechnical study and the other part will interpret their study. The results will be exposed in class.
- Activity 5. Planning and interpretation of geotechnical study.

**Learning time:** 50h
- Theory classes: 12h
- Practical classes: 4h
- Laboratory classes: 1h
- Guided activities: 4h
- Self study: 29h
### C3: Binders

<table>
<thead>
<tr>
<th><strong>Learning time:</strong> 38h</th>
</tr>
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<tbody>
<tr>
<td>Theory classes: 15h</td>
</tr>
<tr>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td>Self study: 20h</td>
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**Description:**
Content in this term:
- Basic concepts for binder comprehension. Binder materials study (gypsum, lime and cement) from raw materials and the process of manufacturing to the hardening process. Types, applications and uses.
- Ecological and environmental characteristics of binders.
- Regulations of reference. Continue to learn technical vocabulary.

**Related activities:**
- Activity 4. The students will do laboratory sessions using different materials and with the information they will do a questionnaire.

### C4: Water, aggregates, additives and additions (Conglomerates)

<table>
<thead>
<tr>
<th><strong>Learning time:</strong> 30h</th>
</tr>
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<tbody>
<tr>
<td>Theory classes: 7h</td>
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<tr>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td>Self study: 20h</td>
</tr>
</tbody>
</table>

**Description:**
Content in this term:
- Study of the no conglomerate materials that take part in the conglomerate manufacture. Characteristics and properties, its role in the conglomerate, types and applications.
- In aggregates content, granulometric studies for the manufacture can be made.

**Related activities:**
- Activity 6. Interpretation and analysis of several granulometric curves of determinate aggregates.
C5: Conglomerates

Learning time: 74h
- Theory classes: 16h
- Practical classes: 2h
- Laboratory classes: 2h
- Guided activities: 12h
- Self study: 42h

Description:

Content in this term:
- Conglomerate materials study (mortar and conventional and special concrete), type, characteristics (in fresh and hard phases), properties and uses. Dosages of mortars and concretes.
- Ecological and environmental aspects of the conglomerates.
- Normative of reference.

Related activities:
- Activity 7. Special mortars
- Activity 8. Laboratory: Mortars and concretes
- Activity 9. Concrete control
### Planning of activities

| A0 QUESTIONNAIRE: ONE ABOUT THE CONTENT OF THE MEETING OF SUSTAINABILITY AND ANOTHER ABOUT AN ARTICLE RELATED WITH THE THEME. | Hours: 3h  
Guided activities: 1h  
Self study: 2h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>This practice involves answering a questionnaire. The professor at the end of the theoric class will give a questionnaire of the same theme that the student has to answer. Immediately the professor will give a current article of the same topic and the student has to read and answer a test.</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Material class, informatic tools and bibliography.</td>
</tr>
<tr>
<td><strong>Descriptions of the assignments due and their relation to the assessment:</strong></td>
<td>The delivery will be 8 days after the activity proposed in class, through Campus virtual (Atenea).</td>
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</tbody>
</table>

| A1 ANSWER THE QUESTIONNAIRE AFTER THE INFORMATIONAL SKILLS SESSION. | Hours: 3h  
Guided activities: 1h  
Self study: 2h |
<table>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>With this practice pretend that the students begin to research information for doing research projects in the building area. This practice consists in answering a questionnaire after the information skills session.</td>
</tr>
<tr>
<td><strong>Support materials:</strong></td>
<td>Attendance in the session, informatic tools and questionnaire.</td>
</tr>
</tbody>
</table>
| **Descriptions of the assignments due and their relation to the assessment:** | The delivery will be through the Campus (Atenea) 10 days after the session.  
Rigor adequacy of the contents of the response will be assessed and learning achievement. |
| **Guideline:** |  
- Correct answers of the questionnaire: 10 points.  
- Lack of references and sources of information: (not proceed)  
- Delivery of practice out of time: -2 points.  
- Absence without justify in the session..-2 points.  
- Spelling errors, syntax, etc. excessive (>5): -2 points |
| **Specific objectives:** | At the end of the practice, students should be able to:  
Manage, identify and locate the information and access using information research tools.  
To reach the minimum knowledge of the sustainability session. (Materials life, basic concepts, etc...)  
Acquire the capacity of critical analysis of a technique reading. |

| A2 POSTER PROPERTIES OF THE MATERIALS | Hours: 6h  
Guided activities: 1h  
Self study: 5h |
|---|---|
Description: This practice consists in developing a poster (594 x 420 mm) rigid or flexible where it should have this information: the professor gives to each group 3 properties, definitions, etc. which the group has to look for generic definition in a "no technical dictionary" from each word. After understanding the definition, the group has to look for a graphic example (photo, draw, etc) from daily life. After that, the group has to look the definition in a technical dictionary and search for a graphic example related to construction and architecture.

Support materials: Informatic and bibliographic tools.

Descriptions of the assignments due and their relation to the assessment: The delivery will be 10 days after the activity proposed in class. That day, the students will do an exposition (60 min.) where all the students could see the other projects. All the students with the professor will evaluate the posters. Will be chosen the best 5 posters to expose them in the library.

Guideline:
- Scientific content: 5 points
- Original examples: 3 points
- Poster design: 2 points
- Lack of references and sources of information: -2 points
- Delivery of practice out of time and absence without justify in the session: -3 points.
- Spelling errors, syntax, etc. excessive (>5): -2 points.

Specific objectives: At the end of the activity, the students should be able to:
- Achieve the ability to look for information and interpret it.
- Acquire familiarity with the initial concepts.

A3 ANSWER THE QUESTIONNAIRE AFTER THE LABORATORY EXPERIENCE

<table>
<thead>
<tr>
<th>Description:</th>
<th>Hours: 3h</th>
</tr>
</thead>
<tbody>
<tr>
<td>This practice consist in doing a questionnaire after the laboratory experience. Knowing the characteristics of the rocks and given them a purpose of use in a building, decide possible rocks to use, arguing the choice.</td>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td>Support materials: Laboratory assistance, bibliography and ATENEA notes. The exercice.</td>
<td>Self study: 2h</td>
</tr>
</tbody>
</table>

Descriptions of the assignments due and their relation to the assessment: The delivery will be via Atenea 10 days after the laboratory session. Will be evaluated the content of the answers and the learning achievement.

Guideline:
- Correct answers of the questionnaire: 10 points.
- Lack of references and sources of information: (not proceed)
- Delivery of practice out of time: -2 points.
- Absence without justify in the session: -2 points.
- Spelling errors, syntax, etc. excessive (>5): -2 points.
Specific objectives:
At the end of the practice, students should be able to:
Interpret the results of the laboratory experience.
Know how to look for information to answer the questionnaire.

A4 APPROACH AND INTERPRETATION OF A GEOTECHNICAL STUDY

Description:
The class will be divided in two groups, respecting the students groups. The first group has to approach a geotechnical study with some data, and the other group has to interpret some geotechnical study. The results will be exposed in class.

Support materials:
Detailed guide notes of the activities. Notes from ATENEA, bibliography and reference regulations.

Descriptions of the assignments due and their relation to the assessment:
Register by professors checking out conducted learning of the students and evaluating the results of the exhibitions at the end of the sessions.
The delivery of the practice will be 10 days after its proposal and the exhibition 8 days after the delivery. The exposition will be with power point and all the members of the grup have to participate. (Time aprox. of the exhibition 5-7 minutes).

Guideline:
- Correct content of the practice: 5 points.
- Correct content of the exhibition: 3 points

Specific objectives:
At the end of the practice, the student should be able to:
Reading and interpretation the regulation and its application.
Ability to be critical.
Introducing in oral exhibitions.

A5 ANSWER THE QUESTIONNAIRE AFTER THE LABORATORY EXPERIENCE

Description:
Will be carried out the experimental part, and as directed learning is planned that the students previously have to read guide notes and then answer the questionnaire to identify the objects, from the point of view of learning results that have to achieve after the experimentation. The practice will be in the material laboratory, building P, floor -1. Plaster and lime works.

Support materials:
All the material and necessary equipment to carry out the laboratory experiment.
Detailed guide notes with the questionnaire of the experiment. Content notes from ATENEA and bibliography.
A6 DESIGN, EXECUTION AND MORTAR OR CONCRETE TESTS SUGGESTED BY THE PROFESSOR

**Description:**
This practice consists in doing an activity during all the second term. It is proposed to each group one conglomerate (mortar or concrete) material and the students have to do: a first part that consists of material design, plan a dosage and plan the tests. The second part consists in doing the conglomerate in the laboratory and the third part realize the plan tests in the laboratory.

**Support materials:**
All the material and necessary equipment to carry out the laboratory experiment. Detailed guide notes with the questionnaire of the experiment. Content notes from ATENEA and bibliography.

**Descriptions of the assignments due and their relation to the assessment:**
The delivery will be via Atenea the last day of the class. Will be evaluated the content of the answers and the learning achievement.

**Guideline:**
- Correct answers of the questionnaire: 10 points.
- Lack of references and sources of information: (not proceed)
- Delivery of practice out of time: -2 points.
- Absence without justify in the session: -2 points.
- Spelling errors, syntax, etc. excessive (>5): -2 points.

**Specific objectives:**
At the end of the practice, students should be able to:
Interpret the results of the laboratory experience.
Acquire familiarity with the experimental results, their units, errors, sensitivity, etc.
A9 CONCRETE QUALITY CONTROL

Hours: 4h
Practical classes: 1h
Self study: 3h

Description:
Giving some data, the student has to do a concrete quality control plan, and answer a questionnaire.

Support materials:
Detailed guide note. Content notes from Atenea and reference regulation.

Descriptions of the assignments due and their relation to the assessment:
The delivery will be via Atenea 5 days after assistance in the session.
Will be evaluated the content of the answers and the learning achievement.

Guideline:
- Correct content in the practice: 10 points.
- Lack of references and sources of information: -2 points
- Delivery of practice out of time: -2 points.
- Spelling errors, syntax, etc. excessive (>5): -2 points.

Specific objectives:
At the end of the practice, students should be able to:
Apply the acquired knowledge in class.
Look for necessary information in the regulation for do the exercise.

Qualification system

The final mark is the addition of these partial marks:
Nfinal = 25% Np1 + 45% Np2 + 30% QA

Nfinal: Final mark.
Np1: Mark of the first exam.
Np2: Mark of the second exam.
QA: Activities mark (including all the works, practices and questionnaires done during the course).

The midterm and final exams consist on one part with questions about concepts related with the learning objectives of the subjects regarding the knowledge and understanding; and in other part wich is a test with short questions. The student has 3 hours or each exam.

Regulations for carrying out activities

For the fulfilment of some activities (see the subject planning), it will be indispensable that the students have made up groups of 4 to 5 members. These groups will be made up the first day of class and the corresponding required managements for creating the groups will be done.

It is an essential requirement to do at least 2/3 of the planned activities so that the students could pass the subject. If some of the continuous evaluation or lab activities is not done, it will be considered as non-marked.
Bibliography

Basic:


Fernández Olmo, E. Terrenos y ensayos. Madrid: Universidad Politécnica de Madrid,


Others resources:

EHE-08 Instrucción de hormigón estructural.(2008) Madrid: Ediciones de autor técnico


Teachers material at intranet.
Web pages:
www. atedy.es
www. calespachs.com
www. lime.org
www. anfah.es
www. sika.es
www. afam-morteros.com

Audiovisual material