310017 - Construction III

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: 6  Teaching languages: Catalan, Spanish, English

Teaching staff

Coordinator: Capellà Llovera, Joaquin
Others: Anguera De Carlos, Enric
         Agustiño Otero, Manuel

Degree competences to which the subject contributes

Specific:
1. 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.
2. FE-7 Ability to identify the constructive elements and systems, define its function and compatibility, and its implementation to construction in the construction process. Plan and solve constructive details.
3. FE-8 Knowledge of specific procedures for the material execution control of the construction.

Transversal:
4. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
5. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

Teaching methodology

The in-person, directed and autonomous methods will be combined. With the combination of the three methods, the students must achieve the knowledge, comprehension, application, synthesis and evaluation levels.

In the in-person method special attention will be made in the clarity, precision and order aspects by the faculty. These classes will be done by the whole group (big group), and the professor will develop the course topics at class. The students will find all the required documentation in PDF format in ATENEA.

In-person (medium group) the students will do practices at class which will be solved individually. Once finished the practice, the professor will solve the exercise. The delivery will be compulsory and will be graded.

As a group work and in-person there will be done the PUZZLE practice (medium group). Besides achieving the specific objectives of the contents there also will be developed cooperative learning techniques at class.

The autonomous self-learning works in group will be done in maximum 4 members groups. There also will be developed cooperative learning techniques in this case out of class.
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Learning objectives of the subject

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

- To define the meaning of the construction structural components.
- To explain the process and the stages of construction of the structural components.
- To connect the structural components with the ideal materials for its construction.
- To define the properties of the structural components.
- To identify the different construction systems and subsystems of the different structures.
- To use the construction lexical and the awareness of the responsibility of the technicians in the sustainability and environmental respect aspects.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 36h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 9h</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: 15h</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
# Content

## (ENG) C1 MASONRY STRUCTURES

**Learning time:** 12h 30m  
- Theory classes: 3h  
- Guided activities: 1h  
- Self study: 8h 30m

### Description:
In this content the students work:  
- Introduction to the masonry and brickwork structures.  
- Masonry and brickwork.  
- Construction design of masonry and brickwork structures.

### Related activities:
- Activity 2 individually, corresponding to the autonomous self-learning.  
- Activity 3 individually, corresponding to the autonomous self-learning.  
- Activity 4 in group, corresponding to the autonomous self-learning.  
- Activity 5 individually, corresponding to the autonomous self-learning.  
- Activity 7 in group, corresponding to the medium or small group sessions at class.

## C2 WOOD STRUCTURES

**Learning time:** 12h 30m  
- Theory classes: 3h  
- Guided activities: 1h  
- Self study: 8h 30m

### Description:
In this content the students work:  
- Introduction to the wood structures.  
- Wood.  
- Construction design of wood structures.

### Related activities:
- Activity 1 individually, corresponding to the autonomous self-learning.  
- Activity 2 individually, corresponding to the autonomous self-learning.  
- Activity 3 in group, corresponding to the autonomous self-learning.  
- Activity 4 individually, corresponding to the autonomous self-learning.  
- Activity 6 in group, corresponding to the medium or small group sessions at class.
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## C3 REINFORCED CONCRETE STRUCTURES (I)

**Learning time:** 35h 30m  
- Theory classes: 9h  
- Practical classes: 2h  
- Laboratory classes: 1h  
- Guided activities: 1h 30m  
- Self study: 22h

**Description:**  
In this content the students work:  
- Introduction to the reinforced concrete structures.  
- Columns and beams.  
- One-way spanning slab.  
- Construction design of reinforced concrete structures (columns, beams and one-way spanning slabs).

**Related activities:**  
- Activity 2 individually, corresponding to the autonomous self-learning.  
- Activity 3 in group, corresponding to the autonomous self-learning.  
- Activity 4 individually, corresponding to the autonomous self-learning.  
- Activity 5 individually, corresponding to the autonomous self-learning.  
- Activity 6 in group, corresponding to the medium or small group sessions at class.

## C4 REINFORCED CONCRETE STRUCTURES (II)

**Learning time:** 28h  
- Theory classes: 6h  
- Practical classes: 1h  
- Laboratory classes: 2h  
- Guided activities: 5h  
- Self study: 14h

**Description:**  
In this content the students work:  
- Two-way spanning slabs.  
- Reinforced slabs.  
- Construction design of reinforced concrete structures (two-way spanning slabs and reinforced slabs).

**Related activities:**  
- Activity 2 individually, corresponding to the autonomous self-learning.  
- Activity 3 in group, corresponding to the autonomous self-learning.  
- Activity 4 individually, corresponding to the autonomous self-learning.  
- Activity 5 individually, corresponding to the autonomous self-learning.  
- Activity 6 in group, corresponding to the medium or small group sessions at class.
## C5 Prestressed and Poststressed Structures

<table>
<thead>
<tr>
<th>Learning time: 25h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Practical classes: 1h</td>
</tr>
<tr>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td>Guided activities: 1h 30m</td>
</tr>
<tr>
<td>Self study: 15h</td>
</tr>
</tbody>
</table>

### Description:
In this content the students work:
- Introduction to the prestressed and poststressed structures.
- Pre-tensioning.
- Post-tensioning.
- Construction design of prestressed and poststressed structures.

### Related activities:
- Activity 3 in group, corresponding to the autonomous self-learning.
- Activity 4 individually, corresponding to the autonomous self-learning.
- Activity 6 in group, corresponding to the medium or small group sessions at class.

## C6 Metallic Structures

<table>
<thead>
<tr>
<th>Learning time: 36h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 9h</td>
</tr>
<tr>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td>Laboratory classes: 1h</td>
</tr>
<tr>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td>Self study: 22h</td>
</tr>
</tbody>
</table>

### Description:
In this content the students work:
- Introduction to the metallic structures.
- Structural steels.
- Construction design of the metallic structures.

### Related activities:
- Activity 3 in group, corresponding to the autonomous self-learning.
- Activity 6 in group, corresponding to the medium or small group sessions at class.
## Planning of activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours: 55h</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 INDIVIDUAL WORK IN AUTONOMOUS LEARNING: WOOD CONFERENCE (C2)</td>
<td>3h</td>
</tr>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Individually the students will attend the wood lecture.</td>
<td></td>
</tr>
<tr>
<td>Support materials:</td>
<td></td>
</tr>
<tr>
<td>Material given during the lecture.</td>
<td></td>
</tr>
<tr>
<td>Descriptions of the assignments due and their relation to the assessment:</td>
<td></td>
</tr>
<tr>
<td>It represents a part of the continuous evaluation (1% corresponding to the lecture attendance).</td>
<td></td>
</tr>
<tr>
<td>Specific objectives:</td>
<td></td>
</tr>
<tr>
<td>At the end of the activity, the students should be able to:</td>
<td></td>
</tr>
<tr>
<td>- Identify the properties of the structural components of the content 2.</td>
<td></td>
</tr>
<tr>
<td>- Define the components which form a structure of the content 2.</td>
<td></td>
</tr>
<tr>
<td>- To draw construction details of the structure of the content 2.</td>
<td></td>
</tr>
<tr>
<td>- Solve construction details depending on the specific needs.</td>
<td></td>
</tr>
</tbody>
</table>

| Description:                                                            |            |
| Individually the students will do a practice at the contents 1, 2, 3 and 4 which will contain specific learning objectives of the content, with questions related with the topic. Individual development at class. |            |
| Support materials:                                                      |            |
| Notes of the content available in ATENEA.                              |            |
| Descriptions of the assignments due and their relation to the assessment:|            |
| It will be delivered at the end of the practice. It represents a part of the continuous evaluation (30%). |            |
| Specific objectives:                                                    |            |
| At the end of the activity, the students should be able to:             |            |
| - Identify the properties of the masonry, brickwork, wood and reinforced concrete structural components. |            |
| - Define the components which form a masonry, brickwork, wood and reinforced concrete structure. |            |
| - To draw construction details of a masonry, brickwork, wood and reinforced concrete structure. |            |
| - Solve construction details depending on the specific needs.           |            |

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours: 4h</th>
</tr>
</thead>
<tbody>
<tr>
<td>A4 GROUP WORK FOR SELF-LEARNING AT ATENEA: PHOTOGRAPHY REPORT (CONTENT 1 A 6)</td>
<td></td>
</tr>
<tr>
<td>Description:</td>
<td></td>
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<tr>
<td></td>
<td></td>
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<tr>
<td>Support materials:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Descriptions of the assignments due and their relation to the assessment:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific objectives:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table:

- **Guided activities:** 1h
- **Self study:** 2h
- **Practical classes:** 3h
- **Theory classes:** 14h
- **Guided activities:** 5h
- **Self study:** 33h
- **Practical classes:** 0h 40m
- **Theory classes:** 1h 20m
- **Guided activities:** 0h 40m
- **Self study:** 1h 20m
**Description:**
In groups of maximum 2 students.
Make a photographic report of the different execution stages of a construction component of the contents 1 to 6, specifying in writing all the terminology and the construction process. To detect the bad execution and propose solutions.
It will be presented in Word and JPG format and the delivery will be done by ATENEA.

**Support materials:**
Notes of the content available in ATENEA.
Digital camera.

**Descriptions of the assignments due and their relation to the assessment:**
It represents a part of the continuous evaluation (4%).

**Specific objectives:**
At the end of the practice the students should be able to:
- Identify and use with examples the correct terminology of the elements, materials and related techniques of the reinforced concrete structures.
- Visually interpreting of the contents learned at class by the bibliography.
- Use the given information in new specific situations.
- Distinguish between the good and the bad execution of the reinforced concrete structures.
- Propose solutions for a bad execution.

**AS INDIVIDUAL WORK FOR SELF-LEARNING AT ATENEA: TEST (CONTENT 1 a 5)**

<table>
<thead>
<tr>
<th>Hours</th>
<th>Guided activities: 1h</th>
<th>Self study: 4h</th>
</tr>
</thead>
</table>

**Description:**
Realization of a questionnaire of the contents 1 to 5 which contain most of the specific learning objectives of the content, with questions related with the topic. Individual fulfilment out of class, by a questionnaire in ATENEA. Restricted time for solving the questionnaire.
Subsequently, the professor reviews the marks and during the next session does a general reflection at class about the most common errors and the associated learning objectives which should be reinforced.

**Support materials:**
Notes of the content available in ATENEA.

**Descriptions of the assignments due and their relation to the assessment:**
Questionnaire by ATENEA. It represents a part of the continuous evaluation (3%).

**Specific objectives:**
At the end of the activity, the students should be able to:
- Identify the properties of the structural components of the contents 1 to 5.
- Define the components which form a structure of the contents 1 to 5.
- To draw construction details of the structure of the contents 1 to 5.
- Solve construction details depending on the specific needs.

**A6 INDIVIDUAL WORK IN AUTONOMOUS LEARNING: FORMWORK CONFERENCE (CONTENT 3 A 6)**

<table>
<thead>
<tr>
<th>Hours</th>
<th>Guided activities: 1h</th>
<th>Self study: 3h</th>
</tr>
</thead>
</table>

**Description:**
Realization of a questionnaire of the contents 3 to 6 which contain most of the specific learning objectives of the content, with questions related with the topic. Individual fulfilment out of class, by a questionnaire in ATENEA. Restricted time for solving the questionnaire.
Subsequently, the professor reviews the marks and during the next session does a general reflection at class about the most common errors and the associated learning objectives which should be reinforced.

**Support materials:**
Notes of the content available in ATENEA.

**Descriptions of the assignments due and their relation to the assessment:**
Questionnaire by ATENEA. It represents a part of the continuous evaluation (3%).

**Specific objectives:**
At the end of the activity, the students should be able to:
- Identify the properties of the structural components of the contents 3 to 6.
- Define the components which form a structure of the contents 3 to 6.
- To draw construction details of the structure of the contents 3 to 6.
- Solve construction details depending on the specific needs.
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**Description:**
Individually the students will attend the formwork conference.

**Support materials:**
Material given during the conference.

**Descriptions of the assignments due and their relation to the assessment:**
It represents a part of the continuous evaluation (1% corresponding to the lecture attendance).

**Specific objectives:**
- At the end of the activity, the students should be able to:
  - Identify the properties of the structural components of the contents 3 to 6.
  - Define the components which form a structure of the contents 3 to 6.
  - To draw construction details of the structure of the contents 3 to 6.
  - Solve construction details depending on the specific needs.

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**A7 GROUP WORK AT CLASSROOM: MAKING PUZZLE (ICE) (CONTENT 1 A 6)**

<table>
<thead>
<tr>
<th>Hours</th>
<th>5h 20m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical classes</td>
<td>1h 20m</td>
</tr>
<tr>
<td>Theory classes</td>
<td>0h 40m</td>
</tr>
<tr>
<td>Self study</td>
<td>3h 20m</td>
</tr>
</tbody>
</table>

**Description:**
In groups of 2 students.
The groups will work together for making specific details of the contents 1 to 6, which will be explained at class.

**Support materials:**
Notes of the content available in ATENEA.

**Descriptions of the assignments due and their relation to the assessment:**
The attendance is compulsory.
At the end of the practice the professor will explain the solution.
It represents a part of the continuous evaluation (4%).

**Specific objectives:**
At the end of the practice the students should be able to:
- Identify the properties of the structural components.
- Define the components which form the structure.
- Interpret construction details of the structure.
- Solve construction details depending on the specific needs.
- Distinguish the construction components of a structure.
- Identify and use with examples the right terminology of the components, materials and techniques related with the structures.
- Propose solutions for a bad execution.
- Prove a construction detail from the used criteria.
- Defend the activity done.

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**A8 EVALUABLE TEST (CONTENT 1 A 6)**

<table>
<thead>
<tr>
<th>Hours</th>
<th>70h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>42h</td>
</tr>
<tr>
<td>Theory classes</td>
<td>19h</td>
</tr>
<tr>
<td>Practical classes</td>
<td>3h</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6h</td>
</tr>
</tbody>
</table>
## A2 INDIVIDUAL WORK IN CLASSROOM: PRACTICE (CONTENTS 1, 2 AND 3)

<table>
<thead>
<tr>
<th>Description:</th>
<th>Hours: 3h</th>
</tr>
</thead>
</table>
| Individually the students will do a practice at class of the contents 1, 2 and 3 which will contain specific learning objectives of the content, with questions related with the topic. Individual development at class. | Practical classes: 1h  
Theory classes: 1h  
Self study: 1h |

| Support materials: | |
| Notes of the content available in ATENEA | |

| Descriptions of the assignments due and their relation to the assessment: | |
| It will be delivered at the end of the practice. It represents a part of the continuous evaluation (7%). | |

| Specific objectives: | |
| At the end of the activity, the students should be able to: | |
| - Identify the properties of the masonry, brickwork, wood and reinforced concrete structural components. | |
| - Define the components which form a masonry, brickwork, wood and reinforced concrete structure. | |
| - To draw construction details of a masonry, brickwork, wood and reinforced concrete structure. | |
| - Solve construction details depending on the specific needs | |
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**Qualification system**

Individual practice regarding the wood lecture. The practice worths the 1% corresponding to the attendance to the wood lecture of the content 2 (activity 1).

The students will be evaluated individually by a graphic and written exam. This exam worths the 7% in the contents 1 to 3 (activity 2).

The students will be evaluated individually by a graphic and written exam. This exam worths the 30% in the contents 1 to 4 (activity 3).

The autonomous group learning will be evaluated with the 4%. It will be divided in the contents 1 to 6 (activity 4).

The autonomous self-learning will be evaluated individually by a questionnaire. The questionnaire of the contents 1 to 5 will worth the 3% (activity 5).

Individual practice regarding the formwork lecture. The practice worths the 1% corresponding to the attendance to the formwork lecture of the contents 3 to 6 (activity 6).

The group practice at class will be evaluated by its presentation. The practice worths the 4%, divided into the contents 1 to 6 (activity 7).

It will be evaluated individually a graphic and written exam which will be a general application of the subject and will worth the 50%. This evaluable exam will be done the last day of class (activity 8). In this exam it will be evaluated the third language in a section of it.

The evaluable exam consist on the one hand in questions about associated concepts to the learning objectives of the subject regarding to the knowledge or the comprehension, and a group of application exercises. The students have approximately 2 hours for solving the exam. The continous evaluation consist on doing different activities, both individual and in group, with accumulative and educational nature, done during the course (in and out of class).

**Reevaluación**

El estudiante que haya obtenido una calificación final de suspenso con una nota numérica comprendida entre 3.5 i 4.9 tendrá la opción de presentarse a una prueba única de revaluación, que incluirá la totalidad de los Contenidos y se realizará en el periodo establecido al efecto. Si supera esta prueba, la calificación final de la asignatura pasará a ser aprobado (5.0). No podrá realizar la prueba de reevaluación el estudiante que cumpla alguna de las siguientes condiciones:

i) ya ha aprobado la asignatura.

ii) su calificación final está por debajo de 3.5 (incluye el caso NP, que es 0 NP).

**Regulations for carrying out activities**

. If some of the continous evaluation activities is not done, it will be considered as non-marked.
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Bibliography

Basic:


Complementary:


Others resources:

Files of the topics presented in class and posted on the Virtual Campus.

Web Link

- Hyperlink
  - Biblioteca
    - http://bibliotecna.upc.es/
  - Diapoteca
    - http://bibliotecna.upc.es/diapoteca/

Audiovisual material

- Guía Virtual

  - Diccionario visual de la construcción

  - La gestión de los Residuos