480602 - ETCE - Construction and Building Construction Engineering and Technologies

Coordinating unit: 250 - ETSECCPB - Barcelona School of Civil Engineering
Teaching unit: 706 - EC - Department of Construction Engineering
210 - ETSAB - Barcelona School of Architecture
753 - TA - Department of Architectural Technology

Academic year: 2018
Degree: MASTER'S DEGREE IN TECHNOLOGY FOR HUMAN DEVELOPMENT AND COOPERATION (Syllabus 2012). (Teaching unit Optional)
MASTER'S DEGREE IN SUSTAINABILITY SCIENCE AND TECHNOLOGY (Syllabus 2013). (Teaching unit Optional)
MASTER'S DEGREE IN SUSTAINABILITY (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 5

Teaching languages: Spanish, English

Coordinator: MIREN ETXEBERRIA LARRAÑAGA

Others: Primer quadrimestre:
JESÚS MIGUEL BAIRÁN GARCÍA - 10Q1
SANDRA CINTA BестRATEN CASTELLS - 10Q1
MIREN ETXEBERRIA LARRAÑAGA - 10Q1

Opening hours
Timetable: Thursdays from 16:00 to 19:00

Degree competences to which the subject contributes

Specific:
1. The ability to apply the most suitable technologies that are available in the spheres of water; energy; habitat; infrastructure; ICTs; agriculture, livestock and forestry production; and environmental conservation to development cooperation.
To understand the role of construction in development programs and its transversal implications. As well as the impact of technology within a social, local and global context.

To know, understand and be able to apply the specific construction technologies acquired in the context of development and international cooperatives.

To have the necessary analytical ability analysis and knowledge to carry out an infrastructure Project in the context of cooperation for development on a local scale.

To know the production processes and basic properties of low cost construction materials.

To know the employment of construction and demolition waste as well as industrial by-products for production of sustainable construction materials.

Learning objectives of the subject

The following teaching methods will be used in the development of the course:

Lecture or conference (EXP): Sharing knowledge through lectures by professors or by external guest speakers.
Problem solving and case studies (RP): group decision exercises, debates and group dynamics, with the teacher and students in the classroom; class presentation of an activity carried out individually or in small groups.
Tutorials of practical or theoretical works (TD): to perform an activity in the classroom, or a theoretical or practical exercise, individually or in small groups, with the advice of the teacher.
Carry out a project, activity or work of reduced scope (PR): to carry out, individually or in a group, of a homework assignment of reduced complexity or scope, applying knowledge and presenting results.
Extensive project (PA): learning based in the design, planning and realisation in groups of a complex or extensive project or piece of work, applying and extending knowledge and writing a report on this approach and the results and conclusions.

Training activities:

The following training activities will be used in the development of the course:

Face-to-face
Theoretical classes and conferences (CTC): knowledge, understanding and synthesis of contents presented by the lecturer (professor) or by guest speakers.
Practical classes (CP): participation in group exercises, as well as discussions and group dynamics, with the teacher and other students in the classroom.
Presentations (PS): class presentations of an activity carried out individually or in small groups.
Theoretical/practical work tutorials (TD): carry out in the class an activity or exercise, theoretical or practical in nature, individually or in small groups, with the advice of the professor.

Remote
Carry out a project, activity or work of reduced scope (PR): to carry out, individually or in a group, of a homework assignment of reduced complexity or scope, applying knowledge and presenting results.

Carry out an extensive project or piece of work (PA): design, plan and conduct individually or in groups, a complex or extensive project or piece of work, applying and extending knowledge and writing a report on this approach and the results and conclusions.
Autonomous study (EA): study or development of the subject individually or in groups, understanding, assimilating, analysing and synthesising knowledge.
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To know alternative products and technologies in order to build low cost housing, as well as understanding the basic characteristics of the most use construction materials.

To be able to detect the most important aspects related with quality and durability of buildings and infrastructures, bind to permanent, semipermanent and temporary buildings.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 30h</th>
<th>24.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Guided activities: 15h</td>
<td>12.00%</td>
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<td>Self study: 80h</td>
<td>64.00%</td>
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</table>
# 1. Introduction. The construction activity on developing countries

**Description:**
Construction in development programs. Analysis of construction involvement in economic development. Housing construction policies in urban and rural areas.

**Related activities:**
Activity 1: Life cycle of a semi-permanent building planned for 5 years

<table>
<thead>
<tr>
<th>Learning time: 3h</th>
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<tbody>
<tr>
<td>Theory classes: 2h</td>
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<tr>
<td>Practical classes: 1h</td>
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</table>

## 2. Projects and construction processes

**Description:**
Define the parts of a construction project. The implementation of the logical framework will be defined in construction projects. A talk given by an external professional on construction works direction/management in a developing country.

**Related activities:**
Activity 2: Analysis of the composition of Construction Projects

<table>
<thead>
<tr>
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<tr>
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<tr>
<td>Guided activities: 1h</td>
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</table>

## 3. Sustainable and low cost technologies

**Description:**
Description of alternative products and technologies in order to build social using solutions characterized by: low consumption of energy and materials in the production process, use of local or national resources, allow self-construction, decentralization of production, etc. A conference will be imparted by an expert in the subject.

**Related activities:**
Activity 3: Reading and presentation of a scientific paper.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Theory classes: 2h</td>
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<tr>
<td>Practical classes: 1h</td>
</tr>
</tbody>
</table>
### 4. Construction Materials

**Learning time:** 5h 30m

- Theory classes: 3h
- Practical classes: 2h 30m

**Description:**
It will describe building materials used in developing countries: stone, wood, bamboo, cementitious materials (mortar, concrete, ferrocement), earth (rammed and blocks), ceramic. A talk will be given by a specialist on earth constructions and bambu

**Related activities:**
Activity 4: Analysis of a construction material and two case studies

### 5. Eco-materials (recycling)

**Learning time:** 4h 30m

- Theory classes: 2h
- Laboratory classes: 1h 30m
- Guided activities: 1h

**Description:**
The use of recycled aggregates and industrial by-products in the manufacture of new sustainable materials will be described.

**Related activities:**
Activity 5: Visit recycling plant. Work laboratory

### 6. Design criteria and specifications in buildings and small infrastructures. Permanent constructions

**Learning time:** 4h

- Theory classes: 2h
- Practical classes: 2h

**Description:**
The conditions for the design, building and maintenance of the durable housing, health facilities, educational facilities and productive facilities shall be described.
### 7. Temporary and semi-permanent construction

**Description:**
Description of the key elements to consider in a state of emergency. Possible responses shall be defined, with respect to the construction of temporary buildings in emergency state and semipermanent buildings for post-emergency state.
A talk will be given by a professional on emergencies situations.

**Related activities:**
Activity 6: Reading and presentation of a scientific paper or technical report

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<tr>
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<tbody>
<tr>
<td>Theory classes:</td>
<td>2h</td>
</tr>
<tr>
<td>Practical classes:</td>
<td>1h</td>
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### 8. Earthquake-resistant buildings. Buildings and infrastructure

**Description:**
Basic knowledge of the earthquake actions and characterization of the seismic loads. Types of seismic risks in terms as function of site and mitigation. Effects of earthquakes on buildings and infrastructures and structural behavior. Basis of earthquake resistance design of buildings and structural arrangements. Earthquake resistance systems for low cost housings and use of alternative materials.

**Related activities:**
Activity 7: Design of seismic resistant constructions.

<table>
<thead>
<tr>
<th>Learning time:</th>
<th>5h</th>
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<tbody>
<tr>
<td>Theory classes:</td>
<td>3h</td>
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<tr>
<td>Practical classes:</td>
<td>2h</td>
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### Planning of activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td><strong>A1. LIFE CYCLE ANALYSIS OF A SEMI-PERMANENT CONSTRUCTION BUILT FOR FIVE YEARS</strong></td>
<td>1h</td>
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<tr>
<td>Description: It is proposed to construct a building employing different materials. A life cycle valuation of a construction will be carried out according to the use of adequate technologies and materials.</td>
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<tr>
<td><strong>A2. ANALYSIS OF THE COMPOSITION OF CONSTRUCTION PROJECTS</strong></td>
<td>2h</td>
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<tr>
<td>Description: Several construction projects will be facilitated and the composition of the project will be discussed: memory, plans and budget. The following points will be analyzed:  - If the project has all the documents required.  - If the projects' report is well described and if it has all necessary annexes. Some of the very important annexes are: the logical framework analysis, environmental impact and health and safety document, etc. If the project's report is not considered complete, its minimum requirements must be defined, described and the report must be finished.  - If the specific sheet is oriented to that country.  - According to these plans, check for details. Students will select and research for themselves a construction project carried out in a developing country and evaluate if it is completed or not.</td>
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<tr>
<td><strong>A3. READING AND PRESENTATION OF A SCIENTIFIC PAPER</strong></td>
<td>2h</td>
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<tr>
<td>Description: A proposed lecture on the reading of a scientific paper published in an international journal. The paper will be based on policy of self-construction, housing needs, etc. The students must give a presentation of aprox. 15 minutes based on the paper. It is recommended to develop a presentation based on the same order as the paper: a) introduction; b) results; c) discussion and d) conclusion. And finally, a personal analysis must be required.</td>
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<tr>
<td>Descriptions of the assignments due and their relation to the assessment:</td>
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<tr>
<td>A class presentation will be conducted and a brief document was handed to the staff analysis and critique that speaks or raises in the article.</td>
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<td><strong>A4. ANALYSIS OF A CONSTRUCTION MATERIAL AND TWO CASE STUDIES</strong></td>
<td>2h</td>
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<tr>
<td>Description:</td>
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<tr>
<td></td>
<td>Theory classes: 2h</td>
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</tbody>
</table>
### A5: Visit recycling plant. Work laboratory

**Hours:** 2h  
Theory classes: 2h

**Description:**  
On the one hand, an existing recycling plant in Barcelona will be visited and the recycled material produced will be analyzed.  
On the other hand, in the laboratory of the Department of Civil and Environmental Engineering will work with different waste and its applicability.

### A6. READING AND PRESENTATION OF A SCIENTIFIC PAPER OR TECHNICAL REPORT

**Hours:** 2h  
Theory classes: 2h

**Description:**  
The activity will include the analysis of different temporary and semi-permanent constructions considering the implementation of adequate technological solutions in sites with seismic risks. The student should consider the seismic aspects in the performance of the construction and adequacy of the solution. This activity is individual.

**Descriptions of the assignments due and their relation to the assessment:**
Individual work.

### A7: Design of seismic resistant constructions.

**Hours:** 2h  
Theory classes: 2h

### A8. CONTROL WRITTEN TEST OF KNOWLEDGE

**Hours:** 1h  
Theory classes: 1h

### Qualification system

- **EV1:** Written test (PE). 20%  
- **EV2:** Individual or group coursework (TR). This includes results and reports and their oral presentation. 60%  
- **EV3:** Class and laboratory attendance and participation (AP). 5%  
- **EV4:** Performance and quality of group work (TG). 15%

### Regulations for carrying out activities

At least 80% of the activity should be carried and the attendance to the all seminars is mandatory to be evaluated the subject.
Bibliography

Basic:


Others resources:

Further bibliography:
Each issue will have its supplementary material provided by a digital campus.