

## Using Construction Waste (250723)

### General information

<b>School:</b>	ETSECCPB
<b>Departments:</b>	Departament d'Enginyeria Civil i Ambiental (DECA), Departament de Tecnologia de l'Arquitectura (TA), Escola Tècnica Superior d'Enginyeria de Camins, Canals i Ports de Barcelona (ETSECCPB)
<b>Credits:</b>	5.0 ECTS
<b>Programs:</b>	MÀSTER UNIVERSITARI EN ENGINYERIA ESTRUCTURAL I DE LA CONSTRUCCIÓ, pla 2015 - (codi pla 1140)
<b>Course:</b>	2015/2016
<b>Course language:</b>	Castellano

### Faculty

Responsible faculty: Marilda Barra Bizinotto

Teachers: Diego Fernando Aponte Hernández, Marilda Barra Bizinotto, Adriana Haydee Martinez Reguero, Susana Valls Del Barrio

### Generic objectives

Subject to introduce the students to recycling of construction and demolition waste products

- Ability to assess the environmental impact of recycling techniques of construction waste

Primary and secondary materials. Basic notions of sustainability and recycling. Chain management. The processes of construction and demolition. Construction and demolition waste. Processed. Recycled aggregates. Recycled concrete. Applications of recycled aggregates in road. Protection of soil and aquifers. Leaching. Urban solid waste. Incineration and incineration slag recycling. Incineration plants. Strategies for emissions. Blast furnace slag. Properties of steel aggregates. Activity. Road applications. Fly ash. Applications. Environmental problems. Factor K. Tires recycling: asphalts (dry and wet roads), in concrete. Inerting and immobilization. Binders treatments. Ceramming. Mining waste. Sludges. Paper industrial waste. Metals.

### Skills

#### *Specific skills*

Designing and building using traditional materials (reinforced concrete, prestressed concrete, structural steel, masonry, wood) and new materials (composites, stainless steel, aluminum, shape memory alloys?).

To apply innovative and sustainable technological aspects in the management and implementation of projects and works.

To analyze the multiple technical and legal conditions arising in the construction of public works, and use proven methods and proven technologies with the aim of achieving greater efficiency in construction while respecting the environment and protecting the safety and health of workers and users of public works.

### **Generic skills of subject**

To develop, improve and use conventional materials and new construction techniques to ensure the safety requirements, functionality, durability and sustainability.

To define construction processes and methods of organization and management of projects and works.

To design plans for safety, quality and environmental and socioeconomic impacts related to the construction process.

### **ECTS credits: total hours of student work**

		Dedication	
		Hours	Percent
Supervised Learning	Theory	33.00	73.3%
	Assignments	2.00	4.4%
	Laboratory	10.00	22.2%
	Supervised activities	0.00	0.0%
Self-Learning		105.00	

### **Contents**

#### **Sustainability - Waste - Recycling**

##### **Dedication**

3.0h. Theory

##### **Description**

Conceptual discussion: Sustainability - Waste - Recycling. Recycling in construction - Life Cycle Materials - Sustainability and Energy Efficiency - Carbon footprint

##### **Objectives**

Enter the cycle of sustainable construction. Distinguish between primary and secondary materials

#### **Construction and demolition waste**

##### **Dedication**

6.0h. Theory + 2.0h. Assignments + 1.0h. Laboratory

**Description**

Processing. Situation in Spain and the world linked and unlinked applications of recycled aggregates in road. Tests and experiences.

Present information in international applications CDW roadworks. Prepare a synthesis of information obtained by all groups

Properties of recycled aggregate. Dosage recycled concrete. Recycled concrete properties in fresh and hardened state. Durability

RCD fines. Technical considerations and environmental quality

Exercise dosing

**Objectives**

Learn landfills processing construction and demolition waste, fixed and mobile plants, recycled aggregates. become acquainted roads with recycled aggregates from Spain

**Soil and water protection. Leaching**

**Dedication**

3.0h. Theory + 3.0h. Laboratory

**Description**

Protection of soil and water. Toxicity of organic and inorganic content. Leaching: General concepts. Essays and legislation. Tendencies

leaching practice

**Fly ash from thermal power plants**

**Dedication**

3.0h. Theory

**Description**

Production. Classification. Properties. Additions. Alkali activation

**Inerting for implementation**

**Dedication**

3.0h. Theory

**Description**

Inerting for implementation

**Steel slag**

**Dedication**

3.0h. Theory

**Description**

Using waste from other industries: Blast furnace slag and steel slag

### **Used tires**

#### ***Dedication***

3.0h. Theory

#### ***Description***

Used tires. Use in concrete and asphalt mix

### **Municipal solid waste**

#### ***Dedication***

3.0h. Theory

#### ***Description***

Municipal solid waste

### **Other usable waste**

#### ***Dedication***

6.0h. Theory + 3.0h. Laboratory

#### ***Description***

Glass, shell of rice, vegetable fibers

Practice other recoverable waste

Recycling of asphalt

### **Classroom assessment**

#### ***Dedication***

3.0h. Laboratory

### **Activities**

### **Grading rules (\*)**

***(\*) The evaluation calendar and grading rules will be approved before the start of the course.***

Continuous assessment: written questions on the subject of the class that must be delivered on paper at the beginning of the next class will be formulated.

All deliveries will be qualified and skilled absence with a zero.

The subject will be adopted with the average from continuing evaluations, representing 30% of the mark, a test representing 30% of the mark and a final paper that represent 40% of the mark.

The work will be delivered on paper and will be presented orally in class (20 minutes).

### **Test rules**

Failure to perform a laboratory or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

### **Teaching methodology**

The course consists of 2,3 hours per week of classroom activity (large size group) and 0,3 hours weekly with half the students (medium size group).

The 2,3 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 0,3 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and references.

### **Office hours**

Thursday from 4:00 p.m. to 6:00 p.m.

### **Basic bibliography**

- Enric Vázquez (Editor). **Progress of recycling in the built environment. Final Report of the RILEM Technical Committee 217-PRE**. Springer. Printforce, The Netherlands. 2013. ISBN 978-94-007-4907-8.