TEACHING GUIDE

Task O1/A5

Clay Placing Course Curriculum based on Ecological challenges and BIM technologies

Consortium members: Associação Portuguesa da Indústria de Cerâmica (APICER), Centro Tecnologico da Ceramica e do Vidro (CTCV), Asociación Empresarial de Investigación Centro Tecnológico del Mármol, Piedra y Materiales (CTM), Asociación Española de Fabricantes (Hispalyt), Institute of Entrepreneurship Development (iED).

Table of contents

1. Course data

Name	CLAY PLACING METHODOLOGIES BASED ON ECOLOGICAL CHALLENGES AND BIM TECHNOLOGIES
Module	Eco-efficient Construction and Sustainable Development
Qualification in which it is taught	*
Other qualifications that could be offered *	Vocational Training Occupational Professional Training Dual Vocational Training Continuing Education
Centre	*
Character	OPTIONAL
Term	Four months
Course	*
Language	Official Language*
Overall workload (hours)	75
Theory class schedule	*
Classroom	*
Practice class schedule	*
Place	*

(*) All the fields marked with an asterisk are subject to completion with the specific information for each educational centre.

2. Teachers data

Teacher responsible	*
Department	*
Area of knowledge	*
Teacher's office location	*
Phone	*
E-mail	*
URL / WEB	*
Tutorial timetables	*
Tutorial location	*
Teaching and research profile	*

(*) All the fields marked with an asterisk are subject to completion with the specific information for each educational centre.

3. Description of the course

3.1. Short description of the contents

- Construction and Sustainable development.
- Environmental regulation and sustainability in ceramic sector.
- Innovative clay product placement methodologies.
- Information technologies applied to ceramic sector.
- Methodologies for calculating environmental impact (LCA, CO2 emissions…).
- The use of BIMclay Application.

3.2. General description of the course

The term sustainable means that it can stand on its own, without depleting natural resources. A world driven by natural resources, requires good management of them, to achieve what is known as sustainable development or satisfaction of the needs of present generations without compromising the possibilities of the future. Sustainable development encompasses three factors, society, economy and environment. To achieve the objective of sustainable development, societies need to develop a series of tools that are undoubtedly the product of research, development and adaptation of the human being to the environment.

In this course, sustainable processes in the ceramic industry are known and studied, understood as those that consume less raw materials, energy and produce less waste, thus producing a lower environmental impact and preserving economic resources.

To this end, the following methodologies will be analysed within the reference regulatory framework for the study of a methodology for the placement of eco-efficient ceramic materials based on the use of new technologies.

1. Life Cycle Analysis (LCA) is a process that allows us to evaluate the environmental burdens associated with a product, process or activity, identifying and quantifying both the use of matter and energy as waste and emissions to the environment, to determine the impact of that use of resources and to evaluate and implement environmental improvement strategies. It includes the complete cycle of the product, process or activity, taking into account the stages of extraction and processing of raw materials, production, transport and distribution, use, reuse and maintenance, recycling and landfill disposal at the end of its useful life.

2. BIM (Building Information Modelling) is a methodology of collaborative work, which is technologically revolutionizing the production chain and management of the building today. This tool, besides facilitating a more efficient construction, allows professionals of the sector to work in cooperation.

The use of tools is an attractive part of the analysis of environmental problems arising from ceramic industry, which require specific techniques. Often, it is necessary to use them in order to obtain the information required to solve an analysis

problem. The objective of this course is to teach the different laying methodologies and their link with environmental challenges and new technologies.

3.3. Objectives of the course

1. Adequate knowledge of new technologies and their link to the ceramics industry.

2. Training of professionals in the ceramics sector in order to increase the quality of the final work, ensuring environmental sustainability.

3. Knowledge of the mechanisms that favour the recovery, reuse and recycling of ceramic materials.

4. Knowledge and ability to design solutions that minimizes the waste generated in the placing processes.

5. Train the student to acquire a critical and scientific way of thinking, to be able to apply the offered technologies to their constructive solution, to respond to the demands of citizens regarding sustainability and to protect the environment during the placing process.

6. Teach the basic operation of the BIMclay Application, as a professional instrument to evaluate the environmental impacts of products, processes and services.

7. Acquire the necessary basic knowledge of LCA, and analyse the databases and impact assessment methodologies available to perform a LCA.

8. Make practical cases that support learning.

9. Present the foundations and the environmental regulations that pertain to ceramic sector development.

10. Teach the operation of the ORC platform, as an online resource center for self-learning in placing methodologies for sustainable development in ceramic industry.

3.4. Contribution of the course to professional practice

This course aims to define the skills, competences and knowledge necessary for the installation of ceramic products, as well as the means necessary to reach the maximum level of efficiency: scaffolding, machines, tools, cranes, etc., considering aspects related to sustainable construction.

It also aims to make future professionals aware of the need to adequately foresee the negative consequences that human actions may have on the environment during the development of a specific project.

In it, students will have the necessary knowledge to develop and apply tools for analysis, decision making, prevention, correction, mitigation, etc., of the negative effects that a particular construction project can cause.

Currently, with the legislative changes that have taken place in recent years, some preventive tools have been included in other environmental permits or authorisations, although they play a fundamental role in minimising environmental problems.

On the other hand, it is worth highlighting the set of measures that allow us to correctly manage the different environmental aspects of a specific activity, which will allow us to comply with current environmental legislation, as well as achieve levels of environmental excellence.

3.5. Recommendations

(*) Completion subject to the criteria of the educational centre.

3.6. Special measures provided

(*) Specific regulations of the educational centre with respect to the establishment of special adaptations in the methodology and the development of teachings for students who suffer some type of disability or limitation.

4. Competencies and learning outcomes

4.1. Basic competences

BC1. Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.

BC2. That students know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.

BC3. That students know how to communicate their conclusions and the knowledge and ultimate reasons that sustain them to specialized and non-specialized audiences in a clear and unambiguous way.

BC4. That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.

BC5. That students have the ability to gather and interpret relevant data to make judgments that include a reflection on relevant issues of a social, scientific or ethical nature.

4.2. General competences

GC1. That the students have demonstrated a detailed and well-founded understanding of the theoretical and practical aspects and the methodology of work in the field of clay product placing and Sustainable placing Processes.

GC2. That students are able to predict and control the evolution of complex situations through the development of new and innovative work methodologies adapted to the field of Environmental Engineering and Sustainable Processes.

GC3. Be able to take responsibility for their own professional development and their specialization in one or more fields in the field of clay product placing.

GC4. Be able to foster, in professional contexts, the technological, social or cultural advancement within a society based on knowledge.

GC5. Be able to take responsibility for their own professional development and their specialization in one or more fields of study.

4.3. Specific competences

SC1. Know the principles of sustainable development applied to methodologies of clay product placing, and the rules that affect the environment.

SC2. Know the procedures related to BIM methodology.

SC3. Knowledge of the impact of the ceramic sector in the achievement of sustainable development and, especially, deepening knowledge of the regulations on the life-cycle analysis of the ceramic products.

SC4. Intensification of the quality of the evaluation techniques in the construction processes, of the sustainability of the sector and its relationship with the BIM methodology.

SC5. Know the different digital tools and methodologies available to increase the efficiency in placement techniques.

SC6. Plan the implementation of techniques that integrate traditional methodologies, consideration of potential environmental impact and collaborative tools.

4.4. Transversal competences

TC1. Aptitude for the written and oral communication, as well as for the analysis, organization, planning and synthesis that provides sufficiency or suitability in the critical reasoning.

TC2. Ability to manage computer tools that allow data management, problem solving and help decision making.

TC3. Aptitude for teamwork, interdisciplinary, that combines interpersonal skills while maintaining respect for diversity, such as coexistence with other cultures.

TC4. Ability to acquire criteria of continuous training, adaptability to social transformations, motivation for quality from creativity.

TC5. Ability to reconcile environmental requirements with the conditions of development.

TC6. Ability to apply ethical criteria and sustainability in decision making.

4.5. Learning outcomes

1. Know the different tools of management, differentiating those of a mandatory nature from those of a voluntary nature.

2. Identify and assess the best techniques in a constructive process.

3. Know the different concepts of the field of sustainability.

4. Know the sustainable construction and the life cycle analysis.

5. Understand sustainability as a new culture in the ceramic sector.

6. Be able to develop an efficient project, taking into account the design, new technologies, and its functionality.

7. Develop the capacity for environmental evaluation of construction projects, and the capacity for self-criticism.

8. Know the different European environmental specific regulations in the field of construction.

9. Know the different available methodologies for clay placing to be able to develop an optimized project.

5. Contents

5.1. Contents of the course

Placement methodologies available. Generation of alternatives. Environmental legislation and sustainability in construction. Construction and sustainable development. Identification and evaluation of impacts. Life cycle analysis of ceramic products. BIM methodologies and applications in the ceramic sector.

5.2. Theory programme

BLOCK I: CONSTRUCTION AND ENVIRONMENT

UNIT 1. Introduction

1.1 Concepts. Introduction to sustainability. Environment.

1.2 Regulatory context of sustainable development and environmental quality.

1.3 Introduction to environmental analysis in construction.

1.4 Sustainability in the ceramic sector: Regulations.

1.5 Status of the level of implementation of sustainable construction.

BLOCK II: SUSTAINABILITY IN CONSTRUCTION WITH CERAMIC PRODUCT

UNIT 2. Life cycle analysis (LCA)

2.1 Definition and scope.

2.2 Normative frame of reference for LCA.

2.3 Definition and presentation of the different phases of an LCA.

2.4 Application to the ceramic sector.

2.5 LCA examples.

UNIT 3. Materials

3.1 Manufactured materials and raw materials.

3.2 European Products Directive.

3.3 Environmental labels and Environmental Product Declarations (EPD).

BLOCK III: PLACING METHODOLOGIES AND BIM TECHNOLOGIES

UNIT 4. Sustainable methodologies of ceramic materials placement.

4.1 Ceramic product placing. Legislative framework.

4.2 Most common methodologies for ceramic product placement.

4.3 Examples of sustainable placing methods. BIMclay Multimedia Materials.

4.4 Examples of quantification of environmental impact.

UNIT 5. APPLICATION OF BIM TECHNOLOGIES IN THE CERAMIC SECTOR

5.1 BIM methodologies (Building Information Modelling). Introduction.

5.2 BIM and ceramic sector. Opportunities.

5.3 BIM objects with integration of sustainable criteria

5.4 Use of Interactive BIMclay Tool.

5.3. Practices programme

Realization of 4 practical cases.

6. Teaching methodology

6.1. Teaching methodology

Activity	Teaching techniques	Student's work	Hours
Theoretical classes	Expositive classes of the theoretical contents. Resolution of doubts raised by students.	On-site:	**12**
		Non-on-site:	0
Solution of problems and practical cases	Resolution of practical cases. Problems are posed to students for their resolution in the classroom. They are solved through the use of blackboard and / or projector. Proposition of exercises for resolution at home.	On-site:	**3**
		Non-on-site:	2
Practices in computer classroom	Search for information, management of databases and use of computer programmes.	On-site:	0
		Non-on-site:	4
Cooperative work activities	Resolution of practical cases. Working groups will be set up in the classroom to carry out practices, monitoring the participation of the group's members.	On-site:	**3**
		Non-on-site:	2
Tutorials	Resolution of doubts about theory, problems and practices.	On-site:	0
		Non-on-site:	3
Seminars and visits to companies and facilities	In the seminars, specific topics of the theoretical syllabus will be expanded. Depending on availability, a visit will be made, or the assistance of an expertise professional will be scheduled.	On-site:	**3**
		Non-on-site:	0
Work / Individual study	Study of the course.	On-site:	0
		Non-on-site:	25
Works / Informs	Realisation of works and reports of practices to be delivered by the student.	On-site:	0
		Non-on-site:	10
Formative evaluation activities	Follow-up and development of works, practices and reports.	On-site:	0
		Non-on-site:	4
Official exams	Preparation, correction and review of written tests.	On-site:	**2**
		Non-on-site:	0
Exhibition of Works	Evaluation and correction of the expositions corresponding to the different works to be carried out by the student.	On-site:	**2**
		Non-on-site:	0
			75

7. Assessment methodology

7.1. Activities and assessment criteria

Activities	Systems and assessment criteria	Percentage Weight (%)
Written tests.	Theoretical-practical knowledge acquired by the student will be evaluated.	60
Assessment of practices cases with ICT support.	Knowledge acquired in practices with ICT support will be evaluated.	5
Individual and teamwork assessment works.	Development and presentations of individual and group works will be evaluated.	30
Other assessment activities.	Attendance and participation to classes of the course will be evaluated.	5
Works		
Individual and teamwork works.	All aspects related to the task to be carried out will be evaluated, from the search of information to the final presentation.	40
Resolution of practical cases.	Both the proposed solution and the analysis of alternatives and the justification of the solutions that have been carried out will be evaluated.	20
Individual and teamwork assessment works.	Development and presentations of individual and group works will be evaluated	30
Other assessment activities.	Attendance and participation to classes of the course will be evaluated.	10

7.2. Control and monitoring mechanism

The control and monitoring of student learning will be done through the following actions:

- Participation in the issues and practical cases raised in class.

- Assistance to theoretical and practical classes.

- Tutorials.

- Carrying out self-evaluation questionnaires.

- Assessment of the individual written test, or of the research works, individual and in group.

8. Bibliography and resources

8.1. Bibliography

Asociación Española de Normalización y Certificación (2017). www.aenor.es

BRE Environmental and Sustainability Standard – BREEAM (2010). www.breeam.org

CTCV (2012) - Estudo de Mercado e Inovação sobre Materiais para a Construção Sustentável, Plataforma para a Construção Sustentável.

Declaración Ambiental de Productos de Construcción (latest access 2018). www.csostenible.net

Eco Platform (latest access 2018). www.eco-platform.org

EN 15804. Sustainability in construction. Environmental Declarations of product. Basic rules of construction product categories.

Green Building Council España (latest access 2018). www.gbce.es

Institut Bauen und Umwelt e.V. (latest access 2018). http://ibu-epb.com

International EPD System (latest access 2018). www.environdec.com

ISO 14025:2010. Environmental labels and declarations. Type III environmental declarations. Principles and procedures.

ISO 21930:2010. Sustainability in building construction. Environmental declaration of construction products.

Productosostenible.net (latest access 2018). www.productosostenible.net

Sistema EPD Habitat (latest access 2018). www.DAPHabitat.pt

8.2. Regulations

UNE-EN ISO 14025:2010. Environmental labels and declarations. Type III environmental declarations. Principles and procedures.

UNE-EN 15804:2012. Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products.

UNE- EN ISO 14020:2002 Environmental labels and declarations. General principles.

UNE-EN ISO 14040:2006 Environmental management. Life cycle assessment. Principles and framework.

UNE-ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.

UNE-EN 15978:2012. Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method.

ISO 15686-5:2008. Buildings and constructed assets. Service life planning. Part 5: Life-cycle costing.

Norma ISO 14001 y EMAS. Community Regulation of Eco-management and Eco-audit.

ISO 14021:2002. Environmental labels and declarations. Self-declared environmental claims (Type II environmental labelling).

ISO 14024:2001. Environmental labels and declarations. Type I environmental labelling. Principles and procedures.

Royal Decree 187/2011 relating to establishment of eco-design requirements for energy-using products - Article 10.

Order VIV/1744/2008, of 9 of June, which regulates General Technical Building Code Registry. Article 2. Organisation.

Decree 21/2006, of 14 of February, which regulates the adoption of environmental criteria and eco-efficiency in buildings - Paragraph 6.2

Royal Decree 105/2008, of 1 of February, which regulates the production and management of construction and demolition waste.

Royal Decree 238/2013, of 5 of April, amending certain Articles and Technical Instruction for the Regulation of Thermal Installations in Buildings, approved by Royal Decree 1027/2007, of 20 of July.

DIRECTIVE 2011/92/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment

REGULATION (EU) No 305/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

DIRECTIVE (EU) 2016/2284 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC

REGULATION (EU) No 525/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC

DIRECTIVE 2010/31/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 May 2010 on the energy performance of buildings

8.3. Online resources and other resources

www.bimclay.eu

www.csostenible.net

www.magrama.gob.es

www.codigotecnico.org

www.eur-lex.europa.eu

www.europa.eu