Course guide
310785 - 310785 - BIM 6d: Digital Materials Management and Decarbonization

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Unit in charge: Barcelona School of Building Construction
Teaching unit: 752 - RA - Departamento de Representación Arquitectónica.

Degree: BACHELOR'S DEGREE IN ARCHITECTURAL TECHNOLOGY AND BUILDING CONSTRUCTION (Syllabus 2019). (Optional subject).

Academic year: 2026 **ECTS Credits:** 3.0 **Languages:** English

LECTURER

Coordinating lecturer: Manuela Ianni

Others: MANUELA IANNI

PRIOR SKILLS

The course is intended for third-year students who have successfully completed Course 2 – Concept Modeling (BIM), or who have prior knowledge of BIM-based tools.

TEACHING METHODOLOGY

The course is based on the methodological approach of learning by doing. Classroom work will be highly practical, based on realistic case studies, where the student takes an active role in solving problems from the professional field.

LEARNING OBJECTIVES OF THE SUBJECT

The current demand to reduce the carbon footprint in building construction requires professionals capable of managing the environmental impact of materials from the initial stages of a project. Therefore, the general objective of this course is to provide the knowledge and operational procedures for the digital management of environmental data of construction products and the monitoring of their emissions.
Through the content of this course, students are expected to achieve the following learning objectives:
-Capability to critically interpret environmental information and indicators of construction products through an analytical reading of their technical documentation.
-Ability to evaluate and select low-environmental-impact constructive alternatives, rigorously applying life-cycle assessment methodologies to interventions on facades and thermal envelopes.
-Mastery of quantification systems and calculation methodologies to precisely define, measure, and verify the embodied carbon footprint and Global Warming Potential of the building.
-Capability to structure and manage environmental information within specialized digital modeling environments, organizing analytical data according to the project's own taxonomy for subsequent export and inventory tracking.
-Capability to apply criteria of circular economy, reference sustainability frameworks, and current regulations to transform digital data into a real operational decision-making tool for integrated project management.

STUDY LOAD

Type	Hours	Percentage
Hours large group	15,0	20.00
Hours medium group	15,0	20.00
Self study	45,0	60.00

Total learning time: 75 h

CONTENTS

title english

Description:
The building sector faces the imminent challenge of decarbonisation, an imperative that has led to the progressive adaptation of current regulations, major international environmental certification schemes (LEED, BREEAM, DGNB), and common European frameworks (Level(s)) towards the principles of the circular economy. Within this technical and regulatory scenario, the course focuses on implementing circular economy concepts in building design from a strictly operational and practical perspective.

After establishing the necessary theoretical and regulatory foundations, the course adopts an instrumental approach centered on converting a BIM (Building Information Modelling) architectural model into a dynamic Material Passport. The main objective is to facilitate the control, traceability, and management of the building's environmental impact throughout its entire life cycle, prioritizing the proper structuring and quality of material-associated data. Throughout the course, the thermal properties of components and key environmental indicators will be analyzed by studying Environmental Product Declarations (EPD), integrating this information into the digital model through specific parameters. In this way, the virtual model is transformed into an operational environmental database capable of automatically generating the Life Cycle Inventory (LCI). Based on these information flows, students will develop the capacity to audit and measure the carbon footprint of the building, from the raw material extraction phase to its deconstruction and demolition. Classroom work will be eminently practical and structured around realistic case studies designed to compare, with a strong documentary focus, different intervention scenarios on the thermal envelope, such as External Thermal Insulation Composite Systems (ETICS/SATE), ventilated facades, or prefabricated systems.

Through this methodology, the course enables students to take on the management of material and environmental information of buildings, preparing them for a key technical role in the sector: ensuring that theoretical sustainability strategies are translated into viable, optimized construction solutions that comply with current regulatory requirements.

Full-or-part-time: 75h
Theory classes: 7h
Practical classes: 15h
Guided activities: 8h
Self study : 45h

GRADING SYSTEM

The course relies on continuous assessment throughout group and individual submissions; all activities will be evaluated using explicit weighting criteria.
Students who are unable to follow or pass the continuous assessment will have the option to take a final exam.

EXAMINATION RULES.

Any continuous assessment activity that is not submitted will be graded as zero.
Demonstrable attendance of a minimum of 80% is strictly required to validate the final grade through continuous assessment.

BIBLIOGRAPHY

Basic:
- Krygiel, Eddy; Nies, Brad. Green BIM : successful sustainable design with building information modeling. Indianapolis : Wiley Technology, 2008. ISBN 9780470239605.
- Sacks, Rafael; Eastman, Charles M; Lee, Ghang; Teicholz, Paul. BIM handbook : a guide to building information modeling for owners, designers, engineers, contractors and facility managers . Third edition. Hoboken, New Jersey : Wiley, [2018]. ISBN 9781119287551.
- De Wolf, Catherine ; Çetin, Sultan ; Bocken, Nancy M. P; De Wolf, Catherine ; Çetin, Sultan ; Bocken, Nancy M. P.. A Circular Built Environment in the Digital Age. Springer, 2024.
- Calkins, Meg. Materials for sustainable sites : a complete guide to the evaluation, selection, and use of sustainable construction materials . ©2009. ISBN 9780470418925.
- Álvarez Gallego, Sergio. La Huella de carbono y el análisis del ciclo de vida . Madrid : AENOR Ediciones, [2017]. ISBN 9788481439502.
- Ruiz Amador, Diego; Zúñiga, Ignacio. Análisis de ciclo de vida y huella de carbono . Madrid : Universidad Nacional de Educación a Distancia, 2012. ISBN 9788436265637.
- McDonough, William; Braungart, Michael; Pérez van Kappel, Gregorio. Cradle to cradle = De la cuna a la cuna : rediseñando la forma en que hacemos las cosas . Madrid [etc.] : McGraw-Hill, cop. 2005. ISBN 9788448142957.
- Hawken, Paul; Lovins, Amory B; Lovins, L. Hunter. Natural capitalism : creating the next industrial revolution . Boston : Little, Brown and Co, cop. 2000. ISBN 0316353000.