Training Course

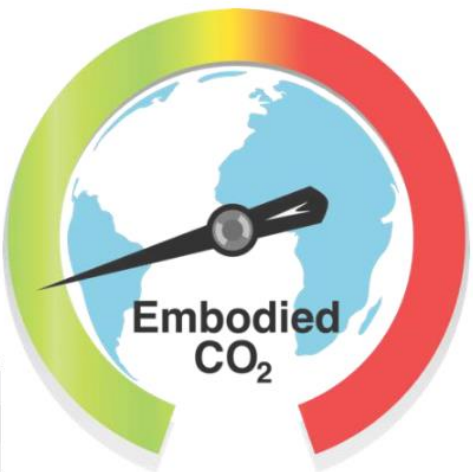
LIFE CYCLE DRIVEN CONSTRUCTION

This course provides a detailed overview of Life Cycle Assessment (LCA) with a focus on structural systems, including buildings, bridges, and infrastructure. Participants will develop a deep understanding of LCA methodology, and its application to reduce embodied carbon through optimized material choices and structural design strategies. The course covers advanced material solutions, including high-strength steel, reinforced concrete, and composite construction methods, as well as high-tech fabrication techniques such as laser cutting and metal 3D printing. By the end of this course, participants will know how to calculate the embodied carbon of structural systems, apply high-tech strategies to lower GHG emissions, and critically assess the life cycle performance of the structures within their practice. Examples from industry leaders will highlight the practical application and benefits of the knowledge provided in this course. This content will also be crucial for complying with upcoming regulations and certifications such as CEN standards, Level(s), LEED, and BREEAM.

SPEAKER

Prof. Alper Kanyilmaz

Alper Kanyilmaz is associate professor in the Department of Architecture, Built Environment and Construction Engineering of Politecnico di Milano in Italy. He is an Expert Advisor for the European Commission Technical group "Steel Applications for New Markets" (Mandate 2023-2028, future low emission industries). Some of his recent works include "How does conceptual design impact the cost and carbon footprint of structures?", "Reuse of Steel in the Construction Industry: Challenges and Opportunities" and "A genetic algorithm tool for conceptual structural design with cost and embodied carbon optimization". Dr. Kanyilmaz has been the principal investigator of 4 EU-projects with a €10 million total budget, and over 40 international partners. He transfers his research experience to the civil engineering and architecture students (300/year) in terms of teaching, MSc and PhD thesis supervision.



COURSE OUTLINE

Module 1: Life Cycle Analysis focused on Structural Systems (buildings, bridges, infrastructure) (2.5h)

- ❑ Introduction, overview of the course and learning outcomes.
- ❑ The power of the construction community to reduce the Greenhouse Gases (GHGs).
- ❑ Life Cycle Analysis and its stages related to a structural systems of buildings, bridges and infrastructure:
  - o Product stage "raw materials" (A1), "transport" (A2), "manufacturing" (A3), construction stage "transport" (A4) and "installation" (A5).
  - o End-of-life stages (C1, C2, C3, C4).
  - o Beyond Life (D), circular economy principles (reuse, recovery and recycling potential).
- ❑ Case Studies from real world examples showing comparison of different structural materials through LCA results.

Module 2: Calculation of Embodied Carbon for Structural Systems (2.5h)

- ❑ How to calculate the embodied carbon of a structural system ?
- ❑ What are Environmental Product Declarations (EPDs), and how are they used?
- ❑ What are the current regulations (worldwide, European and Portuguese) about low-carbon structural design and construction and upcoming standards (e.g. CEN standards, LEED, BREEAM)
- ❑ Strategies to reduce the embodied carbon by means of structural design.
- ❑ Balancing the cost efficiency and embodied carbon reduction in structures.
- ❑ Hands-on exercise together with attendees to compare different building structures and analyze their embodied carbon (an open access LCA tool will be shared with attendees).

Module 3: GHG reduction strategies by means of high strength steel and concrete, and composite action (2.5h)

- ❑ Properties of high strength steel and concrete, and their influence on GHG reduction.
- ❑ Balancing strength requirements with availability, cost, and building codes.
- ❑ Comparison of conventional steel/concrete vs. high strength alternatives (material volumes, structural demands, cost).
- ❑ Practical examples of projects that use high strength materials to achieve low GHG emissions.
- ❑ Benefits of composite beams, columns, and slabs (optimized section size, material savings).
- ❑ Strategies for end-of-life disassembly or reuse in composite systems.

Module 4: High-tech construction techniques to reduce GHG emissions and increase speed (2.5h)

- ❑ Detailed understanding of of advanced fabrication techniques such as laser cutting (precision, reduced off-cuts) and metal 3D printing (customized shapes, on-demand production, repair of existing components).
- ❑ The role of advanced manufacturing on lowering GHG emissions and increasing construction speed.
- ❑ Parametric and generative design techniques for structural optimization, waste reduction, and cost efficiency.
- ❑ Current successes, challenges, and lessons learned from research projects and real-world examples.
- ❑ Final round-table with course participants.

INFORMATION

Duration: 10h

19, 20, 21 and 22 May 2025

PT Time: 16h30 – 19h00

550€ + IVA 23% (676,5€)

Online

Note : Participants of 2024 Edition can have a 40% discount.

CONTACTS

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