| Course edition | 1 | Academic Year | 2023-24 |
|---|---|---|---|

| Ref. | MBUILD M34 |
|---|---|
| MODULE | SUSTAINABLE CONSTRUCTION MATERIALS AND TECHNIQUES |
| ECTS | 6 |
| Year/Semester | Y2/S1 |
| Class hours | 60h |
| Teaching location | UC, Santander, Spain |

## 1. OBJECTIVES

- To raise students' awareness of the importance of energy and resource efficiency in the construction of infrastructures, as well as the harmful effects they have on the environment throughout their life cycle.
- To provide students with knowledge on sustainable construction materials, techniques and procedures that will enable them to contribute to ensuring the sustainability of new infrastructures throughout their life cycle.

## 2. LEARNING OUTCOMES AND COMPETENCES

Learning outcomes

1. Understand and assess the impact of the principles of LCA and LCCA techniques on the development of infrastructures.
2. Be able to read and interpret a professional LCA as well as to provide a basic analysis.
3. Be familiar with the sustainability and durability of the main construction materials.
4. Be able to propose the use of construction materials that improves the sustainability of infrastructures and buildings.
5. Be acquainted with emerging latest sustainable construction materials, technologies and procedures.

Specific competences:

- To be able to identify and evaluate the most suitable sustainable materials for the construction of infrastructures applying the LCA principles and methodology.

## 3. SYLLABUS/TOPICS

Block 1 (30h). Pablo Pascual:
The road life cycle
Assessing the sustainability of the road asset
Sustainable materials and techniques for the road infrastructure
Noise in roads: impact on LCA
PCRs & EPDs
Introduction to the LCCA

Block 2 (15h). Carlos Thomas:
The concrete: components and life cycle
Sustainable aggregates
Recycled concrete: materials, testing and durability

Block 3 (15h). Julian Kümmel:
Life cycle of typical building materials I
Life cycle of typical building materials II
Influence of walls and roofs on the LCA of buildings

## 4. Mandatory References

- Class notes provided by the lecturers.

## 5. Additional References


- ISO 14040:2006 - Environmental management - Life cycle assessment - Principles and framework.
- Horne, R et al (2011). Life cycle assessment: principles, practice, and prospects. Collingwood, Australia.
- Curran, M A (2012). Life cycle assessment handbook: a guide for environmentally sustainable products.
- Scrivener/Wiley, Hoboken, New Jersey, USA.
- Dhir, R K et al (2016). Sustainable Construction Materials. Woodhead Publishing.
- Khatib, J (2016). Sustainability of Construction Materials. Woodhead Publishing.
- Dhir, R K et al (2019). Sustainable Construction Materials. Recycled Aggregates. Woodhead Publishing.
- Updated scientific publications related to materials, techniques and procedures for the construction of infrastructures, provided by the lecturers.


## 6. Assessment Type

- Distributed only (courseworks and activities developed during the semester).

## 7. Assessment Components and Calculation of Final Grade

### 7.1. Normal assessment

The module will be assessed by:

- Exercises /courseworks, to be developed during the teaching period. Some of them will be in groups, some of them individuals. Details will be defined at the beginning of the classes by each lecturer.
- Oral presentations of the exercises/courseworks, most of the at the end each teaching block. Details will be defined at the beginning of the classes by each lecturer.
- Continuous assessment, based on attendance, participation in class, etc.

| | Nr | Weigh in the final grade | Minimum grade |
|---|---|---|---|
| Exercises/courseworks | 1-10 | 50% | - |
| Oral presentations | 1-10 | 30% | - |
| Continuous assessment | - | 20% | - |
| | | 100% | |

### 7.2. Resit assessment

- If the final grade of the module is FAILED, the student will choose the exercises/courseworks with the lowest grade, improve them, resubmit them and present them orally again in order to obtain a PASS. In those cases where the original exercise/workshop was submitted in group, the new submission will be carried out individually. In those situations, the lecturer will adapt the exercise to accommodate the working effort for an individual submission.
- Deadline of the re-submission will be the last day of the official resit period of the semester at UC.

## 8. TEACHING STAFF

| Name | Position | University | email |
|---|---|---|---|
| Pablo Pascual | Associate Professor | UC | pablo.pascualm@unican.es |
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