Summary
The UE TRC Research Platform Fribourg (former Argamassa Armada) will develop prototypes of structural elements in textile reinforced concrete (TRC) for the context of social housing in Nicaragua, based on the knowledge of the TRC Prototype Pavilion at EPFL Fribourg, where the UE will take place.

Content
This research through the making is based on the use of innovative Textile Reinforced Concrete (TRC), a material with high mechanical properties where a carbon fabric is embedded in a cementitious matrix cast with low-clinker content cements. The use of such cements together with the high efficiency of the material allows to dramatically reduce the ecological footprint of construction (use of less material and with lower energy consumption for production). TRC allows thus building very thin and highly durable structures.

The UE TRC Research Platform Fribourg aims at further exploring the structural, architectonic, environmental and social dimensions of TRC and its application, especially in the context of social housing in Latin America. Based on the TRC Prototype Pavilion, started in 2019 at EPFL Fribourg and prior research on Brazilian architect Lelé’s Argamassa Armada (ferrocement), we will develop TRC elements for social houses in Nicaragua, where the teaching team established a project partnership with Grupo Sofonias, an organization working with local communities in the rural area of Jinotepe, Nicaragua. We will also test the use of LC3 cement for TRC, a sustainable cement developed at EPFL and already implemented in Latin America.

Our working method is a reiterative process of developing through testing at EPFL Fribourg. Students will develop structural elements in textile reinforced concrete, fabricate formwork in folded metal, prepare the textile reinforcement, mix and cast concrete and conceive and test the assembly and behaviour of the TRC elements.

Keywords
Textile reinforced concrete (TRC), social housing, technological and social innovation, knowledge transfer, interdisciplinarity

Learning Outcomes
By the end of the course, the student must be able to:
• Design a structural element / system in textile reinforced concrete for a specific social context
• Construct an formwork system in folded metal
• Dimension a structural element in textile reinforced concrete
• Test structural and material limits
Teaching methods
Work will take place in an atelier format, through drawing, 1:1 fabrication and collaborative discussions. It will be supported by lectures.

Expected student activities
Students will need to understand and go through the complete process of analysis, conception, execution and testing:
1. Analysis / understanding of social and technological context
2. Conceptual design of a structural element
3. Conception and construction of formwork in folded metal
4. Placement of textile reinforcement in the formwork
5. Casting of concrete, unmolding
6. Scientific protocol of the technical information and functional layout of the element and casting process

Assessment methods
Ongoing evaluation; students will be evaluated on the basis of the following criteria:
• ability to work in drawing and 1:1 construction;
• capacity to use testing as a means of advancing an architectural and structural idea;
• collaboration (communication, team work, flexibility within different roles);
• engagement (participation, initiative, responsibility)

Supervision
Office hours Yes
Assistants No
Forum No
Others The UE will take place in the Blue Factory in Fribourg. The train tickets will be reimbursed.

Resources
Bibliography
Selected Readings
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Websites