Résumé
Cette Unité d’enseignement prévoit d’analyser de manière critique le système d’argamassa armada (ferrociment) proposé par Filgueiras Lima, à travers la construction d’éléments en béton textile à l’échelle 1:1 par les étudiants.

Contenu
This Unité d’enseignement (UE) focuses on the building technology developed by the Brazilian architect Filgueiras Lima, based on a specific type of ferrocement construction material (argamassa armada). Through an in-depth analysis of the proposed building technology, the UE proposes to recover this local and highly valuable technique. The course addresses manifold issues such as respect for local building culture through the lens of technological innovation and social technologies, and ultimately aims at formulating potential responses to an urgent need for a durable and efficient construction system to be used for informal (and formal) construction.

For the on site production of argamassa armada elements, Filgueiras Lima proposed a concept for a mobile mini-plant, which could facilitate and divulgate the production of concrete elements by help of local inhabitants. The building system and the mini-plant concept—so far understudied by scholarly, technological research—contains much potential to respond to the above mentioned manifold needs. First, it applies to and is based on the local climate and available materials. Second, it permits rapid, yet solid construction, eventually implemented by masons and rapidly trained workers alike. Moreover, even the historical heritage area (UNESCO), located in the city’s center and currently in despair, may benefit from this technology.

The UE foresees to retrieve and critically analyse the system proposed by Filgueiras Lima, through a close collaboration of a team of researchers from architectural and engineering sciences, based respectively at the Atelier de la Conception de l’Espace (EPFL ENAC IA ALICE), at the Structural Concrete Laboratory (EPFL ENAC IIC IBETON) and the Faculdade de Arquitetura da Universidade Federal da Bahia (FAUFBA). After a first period of analysis, empirical research through 1:1 building tests will be led at the EPFL Labs with UE students from the EPFL during this first part of the UE 2019. Students will produce 1:1 scale elements in textile reinforced concrete.

The established knowledge will be shared with the project partners at the University of Bahia, with the aim to build up a mini-plant in Salvador de Bahia as interface between scientific research and local inhabitants / workers of informal settlements.

Mots-clés
Technological innovation, Local and global knowledge transfer, Textile reinforced concrete (TRC), 1:1 Elements, interdisciplinarity

Acquis de formation
A la fin de ce cours l’étudiant doit être capable de:
• Analyser des éléments et systèmes constructifs de Lelé
• Concevoir des éléments et systèmes en béton textile
• Construire des systèmes de coffrage à l'échelle 1:1
• Dimensionner des éléments en béton textile

Compétences transversales
• Dialoguer avec des professionnels d'autres disciplines.
• Résoudre des conflits de façon productive pour la tâche et les personnes concernées.
• Persévérer dans la difficulté ou après un échec initial pour trouver une meilleure solution.

Méthode d'enseignement

1:1 test, lectures, visits, collaborative discussion

Constructive investigations
A critical review of the strengths and weaknesses of the argamassa armada technique, will allow for significant progress in the development of thin construction elements such as folded members or shells. It is the aim to identify efficient construction solutions (ease of formwork, efficiency of the structural lay-out) and to update the argamassa armada technique with recent technological inputs, in order to optimize its frail aspects: steel reinforcement will be replaced by non-corrosive textile mesh (carbon fibre).

The UE proposes to the students to analyze the students work of the 2018 UE and develop it further. Students will produce 1:1 scale elements in textile reinforced concrete:

1. Construction of 1:1 formworks
2. Placement of textile reinforcement in the formwork.
3. Casting 1:1 elements under i-beton supervision.
4. Measuring of resistance and ductility in the i-beton lab.
5. Establish a protocol of the technical information and functional layout of the casting process and facility (mini-plant).

Travail attendu
At the end of the course, the student should be able to:
translate architectural drawings and models into 1:1 constructions
use drawing, model and 1:1 construction to resolve tectonic and structural questions
identify the specific climatic and site-specific constraints of a given project work in a group on a collaborative building project

Transversal competences
receive feedback from a critique and respond in an appropriate manner
give feedback to other group members and responding to group critique

Méthode d'évaluation

Ongoing evaluation.
Students will be evaluated on the basis of the four following criteria:
• ability to work in drawing/model and 1:1 construction;
• capacity to use testing as a means of advancing an architectural or structural idea;
• collaboration (communication, team work, flexibility within different roles);
• engagement (participation in exercises, analytical work, initiative)

Encadrement
De Oliveira, Olivia. “L’architecture brésilienne sous les projecteurs”. L’ARCHITECTURE D’AUJOURD’HUI 396 72-77.
Segawa, Hugo ; Lima Guimaraes, Ana Gabriela. “Lelé : le créateur, le constructor, le contexte “. LE VISITEUR 14 / 2009 68-84
Olmos, Susana Acosta ; Cordiyoula, Chango ; Ekerman, Sergio Kopinski. “L’humain au cœur de la fabrique architectural” . L’ARCHITECTURE D’AUJOURD’HUI 396 52-63.