

## **Bachelor/Master Student (m / f / d) – Thesis Topic:**

### **Fractal geometry for pre-casted construction elements**

Energy Competence Centre GmbH (ECC), a company of the Corporate Energies group, is expanding its activities into architecture and construction engineering. Efficient energy use is not the only technology challenge but also the economical use of building materials.

Our goal is to develop prefabricated modular components for an office building. The building will be made up of different pre-casted components, mostly pillars, arches and triangles. Each component must be checked with regard to its dimensions, its structural weight and its stability. One triangular arch element is our focus of attention.

The task is to design and to review this triangular arch element from the different perspectives of diverse experts: The demands of the architecture are reflected in the aesthetics of the form of this triangular arch element. The structural engineer wants material savings but resilient material thicknesses. And the civil engineer wants to reduce construction time and is looking for simple instructions on how to assemble the elements without many tools or technological aid facilities.

#### **Assignment type:**

- **Duration:** approx. 6 months
- **Weekly hours:** 40 hours

#### **Summary description of topic**

The scope of this internship is the development of prefabricated, modular building elements, with a unique architectural shape.

The final shape of the building will be hexagonal, build from smaller triangular elements which will be placed next to one another in a specific way so that the hexagon shape is achieved.

Having smaller elements is beneficial in several ways. For example, it makes the project scalable, and the concept can be used in various building sizes. Furthermore, the smaller elements can be transferred to the construction site easier in comparison to heavy blocks and even to be manufactured at the building site or in a close by location.

For the concept to come into fruition, the following tasks shall be conducted:

- Define the type of material to be used in this prefabricated element
- Analyze different fractal structures of this element.
- Define the final curvature for the element at different loads
- Determine the suitable transport and installation method

#### **Requirements**

- You are at final stage of a bachelor's or master's degree in engineering (preferably in civil or structural engineering)
- Coursework in structural analysis, and advanced reinforced concrete design

- Structural software skills, AutoCAD skills, 3D modeling skills.
- You are fluent in English (written & oral)
- You are curious, flexible, act responsibly and entrepreneurially as well as with a high degree of reliability
- You are focusing on pragmatic solutions and an organized way of working
- You are a team player

A plus but not a prerequisite:

- You have first experience in the field of structural engineering (e.g. from an earlier internship)
- You might know how to use a 3D printer to produce your specified shape of the precast element for the practical verification of your theoretical work
- You have (first) working experience (e.g. internships or similar)
- Knowledge of German

## **We Offer**

- A dynamic international team and work environment
- Flexible working hours
- Great opportunities for personal development

Strengthen the Energy Competence Centre with your skills in its further successful development and support us to overcome the challenges involved!