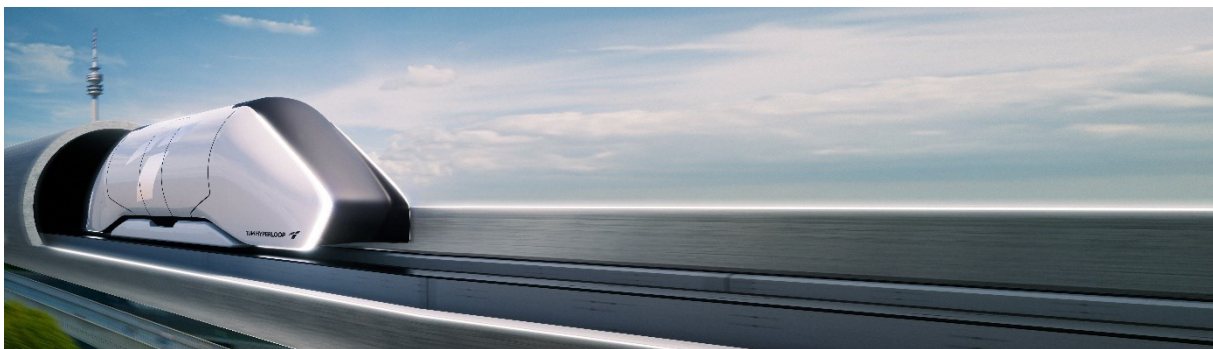


## TUM Hyperloop: Design and Simulation of a CFRP Hyperloop Door with emphasis on the accurate estimation of the spring-in effect

Type: Master's Thesis  
Content: theoretical  
Possible start: 01.11.2024

The TUM Hyperloop Program is envisioning a future where travel is faster, more efficient, and environmentally sustainable. Having successfully completed the development and construction of Europe's first passenger-size hyperloop demonstrator, we are now transitioning to the next critical phases: extending our test track for more comprehensive evaluations, advancing the maturation of our technology, and scaling our operations to meet future deployment objectives.



The goal of this master's thesis is to design, simulate and possibly manufacture a CFRP sandwich door for a pressurized Hyperloop capsule. The first prototype of the door was already designed and manufactured for the full-size Hyperloop Demonstrator, now a rework and optimization shall be done, diving deeper into specialized simulation, like the spring in effect, to produce components with higher precision.

### Your Tasks

- Literature Review: Analyze existing design approaches and manufacturing technologies for sandwich CFRP components, especially on the theory on **Spring-in effect**
- Conceptualization: Analyze possible parameters which influence the deformation during manufacturing, curing and demolding
- Simulation: Simulate the expected deviation of the door due to curing and propose a solution to account for this to produce high precision components
- Verification: if possible, verify the simulation results by conducting hardware tests

### Our Requirements

- Willingness to learn and understand a new, complex research topic in a short time.
- High motivation and the desire to make an impact.
- Enrolled in a degree program in mechanical engineering, aerospace engineering, materials science, or comparable fields.
- Knowledge in composite materials technology, especially CFRP and GFRP.
- Experience with CAD software and structural simulation programs (e.g., ANSYS, Abaqus,

### Our Offer

- Working with students in a highly motivated young research team.
- Getting experience in state-of-the-art passenger transportation systems.
- Helping to shape the next-generation passenger transport system.