

Master / Bachelor / Research Project *

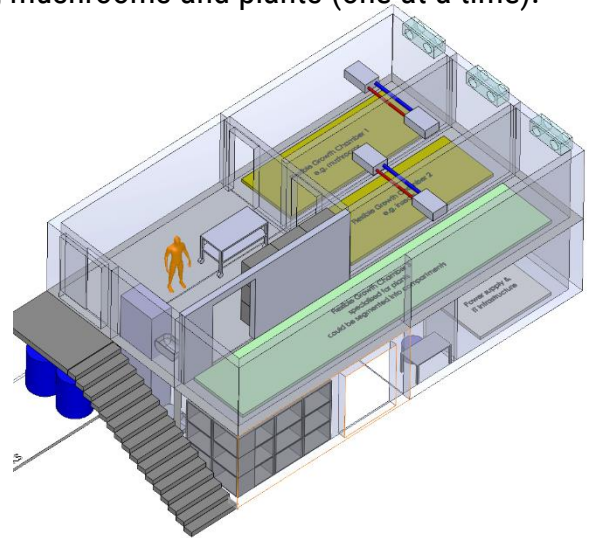
Conceptualization and Configuration of a Flexible CEA Module for Insect, Plant and Mushroom Cultivation

Controlled-environment agriculture (CEA) is becoming increasingly important as a part of the global food chain. It can significantly contribute to a more sustainable and resilient food production by optimizing growing conditions and controlling energy and mass flows, while also reducing the need for pesticides. Plants, insects, mushrooms, algae and more are grown in enclosed modules where the growing conditions can be optimally controlled. This additional degree of freedom compared to traditional agriculture enables more elaborate production and control strategies. To unlock the full potential of CEA, theoretical models and real-world experiments need to be combined. For this reason, a field laboratory consisting of several container sized production units is currently under development and will be built on the TU Campus.

The proposed project focuses on one crucial sub-system: A flexible CEA module, which should contain the infrastructure to run experiments on insects, mushrooms and plants (one at a time).

A suitable configuration needs to be developed in CAD that contains all necessary components and interfaces to other modules (as black boxes). Design choices need to be evaluated in systematic trade-off studies and alternatives should be discussed, that take into account project-specific uncertainties.

Part of the project could involve participation in a Concurrent Engineering Study with an interdisciplinary group of experts (one week in January in Bremen). Such a study is a unique learning and networking possibility that can also significantly elevate the quality of a thesis.



Task description *

- Literature review of state-of-the-art CEA technology and practices
- Analysis of system requirements and estimation of operational ranges
- Iterative development of the configuration in CAD including all major components (black boxes)
- Deriving component requirements and constraints for further development

Requirements: Background in Mechanical Engineering or similar, experienced with CAD

Start: as soon as possible, availability 20th – 24th Jan 2025 necessary

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What to expect: During your research you can expect close guidance, while also maintaining freedom in how you approach the tasks. Through intermediate presentations you can prepare for your final defense and gather feedback from multiple team members throughout your project. The thesis can be written and supervised both in English or German, if your study regulations allow.

* Depending on your background and interests, the task can be adapted to fit master, bachelor or research project.