Designing, experimenting and modeling elective package (Only ME)

Designing, experimenting, and modeling	
Offered by	Department of Mechanical Engineering
Language	English
Primarily interesting for	***ONLY OPEN FOR ME STUDENTS****
Prerequisites	None
Contact person	ir. Rob van der Heijden (r.v.d.heijden@tue.nl)
Last year of education/exam given	2026-2027

Content and composition

In this elective package, students develop the engineering skills of designing, experimenting, and modeling by applying professional technical knowledge. One of these skills is central to each subject. Students work on an assignment in a project group of +/- 8 students for a quartile. Due to the chosen forms of education - Challenge based learning (CBL) - students also gain professional skills such as collaboration, presentation, and planning.

Course code	Course name	Level classification
4GA10 (2022-2023) Q2 4CBLA10 (2023-2024 until 2026-2027) Q2	CBL Design of a launching mechanism	Introductory
4GA50 (2022-2023) Q4 No education (2023-2024) 4CBLB00 (2024-2025 until 2026-2027) Q1	CBL Solar Heat System	Introductory
4GB00 (2022-2023 until 2023-2024) Q1 4CBLA30 (2024-2054 until 2026-2027) Q4	CBL Energy storage and transport	Deepening

Course description

CBL Design of a launching mechanism (4GA10/4CBLA10)

Students design a device, which will launch a projectile. The choice of the design should be justified by a dynamical system simulation which describes and forecasts how the projectile will move between the moment of release and descent. Subsequently the device is modeled in CAD and manufactured by Rapid Prototyping (STL). Then, by an experiment, tests are done to diagnose whether the model fits the reality.

CBL Solar Heat System (4GA50/4CBLB00)

Climate change and global warming are main challenges in modern society. In 2015, 195 countries join the Paris climate agreement, which sets out a global action plan to limit the global warming. To reduce the CO2 emissions, sustainable energy systems play an essential role. Here, we focus on solar water heating systems for domestic use. The aim of this student project is to design, build and test a solar heat system. With this system an amount of water should be heated up as much as possible. This is checked by tapping 1 liter of water from the storage tank at the end of a test cycle and measuring its temperature increase.

CBL Energy storage and transport (4GB00/4CBLA30)

Understanding the time-dependent behavior of a system is of the essence in many engineering applications. To analyze the time-dependent behavior of systems, use is made of models. To provide a setting for getting acquainted with the full cycle of model development, this challenge-based project is placed in the societal context of the energy transition. Within the framework of challenge-based learning, the project groups independently define their own energy storage and transport solution. The goal of this project is to develop a mathematical-physical model for an energy storage and transport system, and to validate this model using experiments.