Engineering Design

This learning line is offered for the last time in 2024-2025. In 2025-2026 an opportunity for re-examination and/or alternative courses/projects will be offered. Re-examination is only available for students that failed the course in the year before.

Engineering Design	
Offered by	Department of Mechanical Engineering
Language	English
Primarily interesting for	All students
Prerequisites	Required courses:
	Recommended courses:
Contact person	Prof. Dr. R. de Lange

Content and composition

We live in a man-made world, which means that (almost) every object in our environment (and the environment itself) has been designed in one way or another. None of these objects are coincidental; they all are the result of a design process in which the designer has attempted to align the proposition for the foreseen user with technical properties of the product.

In this USE-line, the students experience that the design of a product needs constant interaction with the proposed user. This means that they have to go through an actual product design cycle with real customer/user involvement. They have to learn how to define and study a potential market, how to involve user demands into a technical design and how to evaluate the design in a user context.

Obviously, none of these design answers are unique (there are many different types of chairs, bikes, phones, etc.) and multi-disciplinary cooperation is essential: only together they can create innovative technical products where user/society/enterprise aspects are accounted for.

Many Engineering design solutions have a societal/ethical context. The topic choice will be such that it requires the design of a high-tech product with a societal impact. This means that the students will be asked to reflect on the societal impact of the design solutions.

The three projects in this Engineering Design-package teach students to develop, create and evaluate a design with some technical complexity aimed at a specific user, a societal challenge and/or a market.

Course code	Course name	Level classification	2024-2025	2025-2026
4WEU00	Ideation and preliminary design	1.	Regular education	New, alternative course (under development)
4WSU00	Detailing, realization and RPC test	2.	Regular education	New, alternative course (under development)
4WAU00	User testing, evaluation and improvement	3.	Regular education	Re-exam

Course description

4WEU00, Ideation and preliminary design

Before the creation process can start, the students need to define their design goal within the topic framework. This means that they must first define a challenge, and consequently a customer/user for their product and find out the customer/user needs. The students need to find out how to evaluate and assemble customer/user needs in a structured manner and how to turn the result of this evaluation into a well-defined set of requirements, preferences and constraints (RPC) for their to be designed product. While defining their RPC, students should jog down their first ideas and identify potential technologies. Furthermore, students need to do a benchmark to define their competition, this could be combined with a company visit to get a better perspective on their market. Once the RPC have been described, the ideation becomes more focused. This part of the process is crucial in the creation of an innovative, creative solution to the design question. The result must be an innovative Preliminary Design Solution, a first evaluation of this solution against the RPC and a risk-analysis for the next steps.

4WSU00, Detailing, realization and RPC test

The products defined by the student groups in phase 1 (Orientation, Ideation and Preliminary Design) are developed to the MVP (Minimum Viable Prototype) phase. Besides the complexity in the design itself it is expected that the MVP realization requires a significant level of technological complexity and multidisciplinary approach. This means that the choice of materials and production processes is important for a successful MVP. It is however important also to look beyond the MVP phase and predict or estimate required materials and processes for the development phases succeeding the current phase.

The choice of these processes must ensure that the final product will fulfill the RPC. This may mean that the RPC must be re-evaluated and, when/where necessary adjusted. This of course cannot be done by the design team on its own, but has to be negotiated with the project customer. This customer role is carried out by the course teachers team and/or by an real customer group (when available). This mechanism ensures involvement of the market or end user in this early stage of product development.

The result of this phase is a product that is mature enough to be tested against the RPC.

4WAU00, User testing, evaluation and improvement

Each group choses a product from phase 2 (Detailing, realization and RPC test) and this product is now brought to "market". That means: tested with the predefined customer/user In this market/user-evaluation, the students have to define their test, make sure that the results are relevant and reliable. The evaluation of these tests will be a list of improvements for implementation.

The group has to implement these improvements and test their effect. The MVP is turned into a sellable product. In the process of implementation, the group has to evaluate questions on product acceptance: does the product replace another, maybe replace human activity, etc.?

Please note that this brochure only contains descriptions and transition information about the learning line. In the course catalogue you find information about scheduling and type of education and examination.