Zurich University
of Applied Sciences

**zh
aw** **School of
Engineering**

ICP Institute of
Computational Physics

A Web App for Teaching Physics with Gamification

Various methods have been established in order to support traditional teaching with the help of digital tools. So far however, there has been no viable solution to support lectures with digital exercises. The web application e-Exercises (eEx), an online platform for students and teachers, tries to close this gap by providing exercises in a digital form for students and enhance the user experience with elements from computer games. The targeted exercises are focused, but not limited to, MINT (mathematics, information technology, natural sciences and technology) subjects.

There exists a prototype of the Web App eEx, which has been successfully tested in a real teaching scenario. Testing the prototype in a real-world scenario revealed some major shortcomings, foremost the programming language used. The goal of this project is to address these shortcomings and to recreate the program from scratch in ASP.NET and Blazor, an enterprise-grade web development framework. The Web App we developed in this Bachelor's thesis implements some basic functionalities of the original prototype and focuses on well-documented and easily extendable code.

In the course of this thesis, we developed the Web App in ASP.NET using Blazor, starting from the class design and persistence of data in a database to authenticating users and navigating through the dynamically updated webpages. In the current version of eEx, users can securely register and login to the website with the help of Microsoft's high-end Identity application programming interface (API). Teachers can create exercises, which can be published for the students to see. The students can navigate different courses and solve the excises with or without the help of hints. In the code, each class has been thoroughly documented and design decisions are detailed as to why they were chosen.

As teaching moves towards digitalisation, eEx will make it easier to upscale learning capacities and to personalise the learning process. Recreating the project in a modern programming language not only removed the drawbacks of the old prototype, but it also paves the way for future developments.
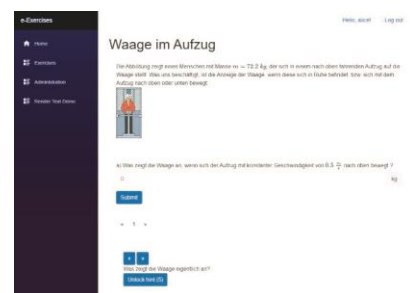
Diplomierende
Jan Albert
Kreshnik Sadriu

Dozierende
Kurt Pernstich
Walter Eich

The logo of eEx.

An online exercise of a physics question including a hint for solving the exercise.