TALLINNA TEHNIKAÜLIKOOL
TALLINN UNIVERSITY OF TECHNOLOGY

Department of Mechatronics

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# TEST BENCH FOR IMPACT TESTING OF DEFORMABLE BODIES
# DEFORMEERITAVATE KEHADE LÖÖK-KATSESEADE

BSc thesis

EXCHANGE PROGRAM

The author applies for
The academic degree
Bachelor of Industrial Engineering

Tallinn
2016

## SUMMARY

This thesis develop a deep analysis about impact testing benches, its components, impact procedure and set up. The thesis is focused on the impact testing device used by Formula Student Team of Tallinn University of Technology; studying its procedure and finding out the problems that should be solved.

In the first section of the thesis, we start with an detailed explanation about the current impact test that are used by engineering companies nowadays. We analyze the different types of impact test, its components, setup and specimens used in each one. In conclusion, we do a comparison between each other and write down the advantages and disadvantages of each test.

The second and third chapter correspond to the main work of the thesis. Firstly, we analyze the Formula Student device. We describe each components and its specific function during the collision process. Then, the collision between the drop weight and a testing piece is studied. Finally, we make an overview about all the process, concluding with different point that should be improved to obtain more accurate results.

The third chapter is the most important section in the thesis because we propose the optimization of Formula device. Based on the problems found in the last analysis, our solution is focused on two main part: the drop falling and the process kickoff. The solution is a piece that has the capacity to integrate the solution of both problems. We explain the design process of the piece, each component and its function in the collision process. Finally, we propose a third solution referred to testing specimen place, which should be fixed to the ground to avoid displacement after the collision.

The last section deal with some impact simulations that are carried out using an engineering program of finite elements, Abaqus. The two first simulations are done with the same material, aluminum, but different geometric shape. The third one uses a same geometry than the previous one, but a different type of material, steel. The last simulation is done using the same testing piece that one of the prototype car piece. Once all simulations are done, we do a deep analysis comparing the different values of force, displacement and energy absorbed obtained in each test.