

To whom it may concern

30 May 2018

Comments on the curriculum in mechanics
developed by the al-Farabi Kazakh National University

The working version of the curriculum in mechanics developed by the al-Farabi Kazakh National University focuses on the preparation of experts in a wide range of engineering applications who also have extended training in mathematics and physics.

Differently from, e.g., the current regulations of bachelor studies in most of European countries, the curriculum is highly ambitious, entails four years of studies and contains training into research via preparation of an extensive graduation thesis.

This combination eventually makes the graduates highly competitive in various fields of engineering and also capable of directly starting a scientific career (e.g., in countries such as the USA where so-called "direct PhD" scheme is available) or moving into the public sector.

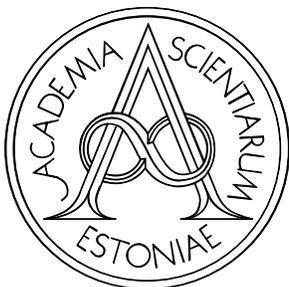
Perhaps most importantly, the proposed in-depth training in many aspects of mathematics and physics during the first two years of study also creates a perfect starting point for the future teaching staff in different universities and colleges. The resulting "flux" of such experts from the al-Farabi Kazakh National University to other universities in the country would clearly support and increase the competitiveness of the entire country.

The curriculum as a whole is adequately balanced between disciplines in mathematics, physics, classic mechanics and courses that provide specialised studies. Even though the title "mechanics" is not particularly popular today (and is often replaced by "applied physics", "technical physics" or similar), the scope of the curriculum adequately reflects the demand on the world market for experts today and, to my opinion, even more so in the future when experts with enhanced knowledge of mathematics and physics are required in many fields.

The overall workload of students seems relatively high (measured by the experience of medium-range universities in many other countries) and students thus must be ambitious and dedicated. This level of

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workload is, however, not exceptional. Even though such a load may put some students under great pressure, it is likely that dedication and hard work of young people during the university years will be converted into solid career of graduates and rapid development of the entire country in the long-term perspective.

The entire structure of the curriculum follows the classic pattern of similar studies. The first two years are filled with basic material whereas more specific disciplines and elective subjects start from the third year and the final semester is reserved for the graduation thesis.

I would still recommend to create an option to study a few specific (perhaps elective) subjects during the final semester. It is expected that by this time many students already know their future perspectives and can benefit from targeted studies.

The overall trend in higher education on the bachelor level is unification and homogenisation of the studies, with the aim of providing fundamental and universal knowledge that would make it possible to either continue specialised studies or to successfully enter into labour market. Specialised skills are usually provided on the master's level of education. In this context, it is somewhat questionable whether the presence of four different specialisations is justified in this particular curriculum. However, given the current needs in experts in the country, this sort of branching might be necessary during a certain time interval.

A typical problem in the design of curricula of this type is how to define the mandatory and elective subjects. It is obvious that every country has its own regulations for obligatory courses and that the graduates must be fluent in more than one language. The pool of elective courses, however, needs some structuring, especially in the case of the particular curriculum that formally contains a massive list of elective courses. In fact, these courses have greatly different weights in the pool of knowledge in mechanics and applied physics. Some of such courses are basically the prerequisites for understanding of many other subjects.

This problem is often resolved by creation of a modular structure of the curricula, by defining the prerequisites for particular subjects, and by means of building examples of recommended standard study plans. It is thus recommended, on the one hand, to define (e.g., on the faculty or department level) which (formally elective) subjects form the core of this curriculum and in which sequence they should be taken. This decision might be formulated as a recommended study plan. It is likely that even if the students may feel that their freedom of choice is somewhat limited during the studies, the graduates will be thankful for such guidance.

On the other hand, it is necessary to leave some space for students' preferences. It is likely that many students make the choice about their future already during the studies. It is important to support this choice by offering specialised elective subjects. In order to be effective, the proportion of such subjects (in terms of credit points) should be at least 10%. The current plan has five slots for such subjects starting from the third study year. This proportion and timing is reasonable.

A part of the titles of electives apparently reflects the wishes of single interest groups both in the university (e.g., professors who have taught specific subjects for a long

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time) and among the potential employers (e.g., dynamically developing new companies and research institutions). Even though such an imprint is usual and may even improve the quality of graduates for certain purposes, I would like to stress that a wide basic education usually improves the chances of graduates in the long-term run. The impact of such imprints can be made smaller or fully neutralised by means of thorough discussions of the content of each subject on the faculty level.

In conclusion, the current draft of the curriculum has a good potential to produce graduates who are highly competitive in the academic landscape, industry and public sector.



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