YONSEI UNIVERSITY

Department of Computational Science and Engineering
Yonsei University, Seoul, 120-749, South Korea
Tel.: +82-2-2123-6121, Fax: +82-2-2123-8194, http://cse.yonsei.ac.kr

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Dr. Dauren Zhakebayev
Al-Farabi Kazakh National University
Almaty, Kazakhstan

To Whom It May Concern:

It is my honor to have a chance to take part in evaluating of Mechanics program in your school. The following is my evaluation report on the program. For each category, my opinions are listed below.

Innovation

This program is focused on training highly educated and highly qualified mechanics experts with knowledge and competencies that are in demand primarily for work in the field of education, as well as meeting the needs of Kazakhstani and foreign higher education institutions and research centers. Given that the area of mechanics including variety of fields such as solid mechanics, fluid mechanics, heat transfer, and control is fundamental for many engineering applications, it is quite proper to establish such a program aimed to nurturing educators or research professionals. Over the world, there has not been many programs with such a purpose. For Kazakhstani researchers to be competitive in the world as well as in the domestic society, such a program is an essential element in education institutions. The area of mechanics requires basic mathematics, physics, chemistry as well as fundamental continuum mechanics, dynamics system and computational methods and the curriculum of the current program really combines them very efficiently. The graduates of this program are expected to play an important role in the 4-th industrial revolution in progress in most regions of the world.

Compliance for the world educational standards

The curriculum of the current program seems to be built to satisfy the purpose of the program which is clearly written. The specialists that the program produces are asked to possess competences which are listed. The required competences are provided in very detail and are consistent with typical outcomes that most schools of world including U.S. and Korea are adopting for their education. 27 modules of course are provided to evenly satisfy the required learning outcomes by the time of graduation. These modules are selected to maintain balance between most areas of mechanics very effectively. The expected results for each education module are clearly and properly listed. The total number of credits and the percentage of the core courses are comparable to those for other schools in U. S. and Korea, but 155 total credits seem to be a little large compared with other countries. Typical range of the total credits is 130~140.

Relevance

Modules are well organized for all the expected learning outcomes. Although there are several courses dealing with computational skills such as Numerical Methods and Programming, Numerical Methods in Applied Mechanics, Computational Fluid Dynamics, etc., more fundamental course for numerical method or coding seems to be needed. For example, a fundamental course such as Numerical Analysis which deals with basic mathematics of numerical methods is missing. The programming language such as C, C++ and Fortran as well as Python need to be taught. Educating coding or programming becomes ever more critical in coming ages. Another element that seems to be missing in the current curriculum is artificial intelligence or big data although there is one course relevant with this issue, Science Data Processing.

Conformity of the learning outcomes to labor market

A list of competences is provided with detailed learning outcomes for each module. In most engineering schools of U.S. and Korea, the Educational Program Outcomes are comparable to competences although the educational purpose of an engineering school is a little different from that of the current program. The followings are the Outcomes that are required commonly to expect from students by the time of graduation:

a. Ability to apply knowledge of mathematics, science, and engineering.
b. Ability to design and conduct experiments, as well as to analyze and interpret data.
c. Ability to design a system, component, or process to meet desired needs.
d. Ability to function as a productive member of a team, which considers multiple aspects of an engineering problem.
e. Ability to identify, formulate, and solve engineering problems.
f. Understanding of professional and ethical responsibility.
g. Ability to communicate effectively, both orally and in writing.
h. Broad education necessary to understand the impact of engineering solutions in a global and societal context.
i. Recognition of the need for, and an ability to engage in life-long learning.
j. Knowledge of contemporary and emerging issues.
k. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice and research.

The labor markets of Kazakhstan and U.S. are different, but fundamental capabilities that students are expected to possess are quite similar. Upon comparison, one can find that most Outcomes are well reflected on the competences except for Outcomes i and j. This difference could be taken into account although it is not easy to satisfy these outcomes using the usual courses.

Recommendations

1. Two Outcomes pointed out above could be reflected on necessary learning competences.

2. The course of Physics could be one of core courses, not elective ones since these courses are of fundamental nature and they are core courses in most schools in U.S. and Korea. These courses are basic for most mechanics courses that follow.
3. Course tree structure needs to be provided so that students can easily recognize typical order of taking courses, and prerequisite courses or possible choices.
4. A course on numerical analysis that deals with basic mathematics of numerical methods could be offered as an elective course.
5. A course on programming could be offered for more intensive training of coding for problem solving in mechanics. Programming language such as C, C++ and Fortran could be taught.
6. Courses on machine learning or big data could be offered since machine learning plays an important role in artificial intelligence or IoT (Internet of Things) in the 4th industrial revolution these days.

Conclusion

Establishing a very effective undergraduate Mechanics program combining mathematics, computation and various mechanics in Kazakhstan is a pioneering step toward securing competitiveness of students belonging to the program in the international society as well as in domestic institutions. The proposed curriculum is expected to fulfill such a mission of the program. For this program to be successfully established, two important elements need to be prepared in addition to the curriculum. One is faculty members who have enough experience in computation-oriented mechanics and can teach those courses very effectively. Second element is computation infra such as computing clusters or supercomputers for high performance computing with computing laboratories for students.

I hope that the above opinions are useful in the improvement of the program.

Sincerely yours,

Changhoon Lee
Prof. and Head of Department of Computational Science and Engineering
Yonsei University
50 Yonsei-ro, Seodaemun-gu
Seoul, Korea
120-749
email: clee@yonsei.ac.kr
homepage: euler.yonsei.ac.kr
phone: 82-2-2123-6131