

Elite technical education: project oriented approach for studying

In today's world there is a necessity of preparing the future engineering leaders in the fields of innovation and entrepreneurship. The National Research Tomsk Polytechnic University has launched a system of elite technical training since 2004. Elite technical education program (hereinafter ETE) is a system of training new generation of engineers through deep fundamental knowledge, development of personal qualities, skills, research and entrepreneurship, as well as projects team work. [1, p. 36]

The goal of ETE is to prepare technicians who will have this set of knowledge and skills that will allow them to solve problems of economic and technological modernization of industries in Russia. Realization of this goal is achieved by developing the following competencies:

- in-depth fundamental knowledge (physics, mathematics, economics);
- professional competence;
- team and project work;
- foreign language communicative competence;
- creative and systematic thinking;
- leadership skills.

Review of existing elite technical education systems in Russia and abroad showed that they appeared due to the economy's needs for highly skilled technical personnel, capable of solving large-scale and non-standard tasks and navigating the modern information space. [2, p. 6,7]

The elite education includes the following steps:

1. Introduction to the project activity course. This course aims to enable students to:
 - know project-management (how to make decisions to carry out certain project at the certain time within limited budget and to the certain result);
 - have basic knowledge of modern computer software;
 - get skills of scientific research work.
2. Fair of ETE projects. It is a set of measures aimed at promoting and enhancing students' project activities enrolled in ETE system. This fair usually includes:
 - Presentation of current projects.
 - Presentation of project experience, success stories, current grant programs.
 - Master classes and business games, such as «Analysis of problems and resource support projects», «Group dynamics and basic groups crises», «Value of the project»; role-playing game «Path of experts.»
 - Call for proposals – the ability to bring the idea of the project to a model that is ready for implementation, and win the initial funding for implementation.
 - Introducing to the scientific interests of research directors in an interactive format TED (5–7 minute videos, freely available on the Internet).
3. Problem-oriented projects

At the 3rd year ETE students have an individual plan, which involves the mandatory participation in the problem-oriented projects. Projects for students are suggested by the departments of TPU and companies of Tomsk. There is a team of students for every project. The results of the projects are: the patent application, reports at the conferences, presentations on the All-Russian competition of scientific works, adoption deed, contracts with companies, making the layout of the device and the device itself, the software.

Elite engineering education is developing with consideration given to the peculiarities of engineering in post-industrial society based on knowledge. Engineering in modern society

is becoming more integrated and innovative. Innovative engineering, while basing upon profound fundamental and practical interdisciplinary knowledge, is aimed at design and development of engineering and technologies that ensure new social and economic effect, and thus are highly demanded and competitive.

The approaches to training the engineering elite are rather similar in Russia and abroad, but there are some differences in the priorities of graduates' expected professional and personal competencies.

The designed elite technical education program on TPU meets the requirements of the CDIO Syllabus in fundamental, professionalism, innovation, entrepreneurship and leadership, takes into account the experience and best practices of training the elite specialists in leading domestic and foreign universities and is aimed at the development of all the basic and universal professional competencies of graduates in engineering and technology. [1, p. 44].

References

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2. Мозгалева П.И., Замятина О.М. Технология проектной работы в системе элитной подготовки технического специалиста в ТПУ. – Москва: Научное обозрение: гуманитарные исследования, № 4, 2012. – С. 6–14.

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