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THE EXPERIENCE OF CIVIL ENGINEERING SPECIALISTS WITH HIGH QUALIFICATION AT BIALYSTOK UNIVERSITY OF TECHNOLOGY

This article shows the learning process of students-engineers in Poland, disciplines which were learning and the projects which were submitted. It also describes what the elements university consists of – library, main departments: architectural, civil and environmental engineering, electrical engineering, computer science, mechanical engineering, management, forestry, amount of students and teachers. The article marks studying process features and courses and subjects content. The main principles of teaching were set out. They were provided with using of the shown information variety methods. Comparison of education processes in Ukraine and in Poland is highlighted in the article.

Keywords: *Bialystok University of Technology, education, learning agreement, composite structures, concrete for special application, concrete structures, demolition, steel structures, structural mechanics, timber and masonry structures, foundations, matura.*

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ДОСВІД ПІДГОТОВКИ ФАХІВЦІВ БУДІВНИЦТВА ВИЩОЇ КВАЛІФІКАЦІЇ В БІЛОСТОЦЬКІЙ ПОЛІТЕХНІЦІ

Викладено відомості про процес навчання студентів-будівельників у Польщі: які дисципліни вивчалися та які проекти були виконані. Описано структурні підрозділи університету – бібліотека та факультети: архітектурний, будівництва та охорони навколишнього середовища, електричний, інформатики, механіки (мехатроніки), менеджменту, лісничий, кількість студентів і викладачів. Відзначено особливості навчального процесу й склад навчальних дисциплін. Наведено основні принципи викладання, різноманітні методи відображення інформації. Зазначено результати порівняння освітніх процесів в Україні та Польщі.

Ключові слова: *Білостоцька політехніка, узгодження навчальних дисциплін, сталезалізобетонні конструкції, бетони спеціального призначення, залізобетонні конструкції, знесення будинку, конструкції зі сталі, будівельна механіка, дерев'яні та кам'яні конструкції, основи і фундаменти, вступний іспит.*

Introduction. Education methods studying in different parts of the world and bringing global experiences to train future engineers in Ukraine is important. Poland is one of the most developed European countries, with high education and science level. Education of civil engineers there has a leading role. Poland attracts modern technologies with active resources use, which are provided by the European Union.

The purpose of this article is to demonstrate the learning process of civil engineers in Poland, to show the specific examples based on the studied subjects, to learn teaching methods in Polish universities and the education system overall. Twelve students from the Building Department of Poltava National Technical Yuri Kondratyuk University had the opportunity to study for one term in Poland, in Bialystok University of Technology. They also explored the educational process.

Main content and results. Bialystok Polytechnic has 65-years history; it has about 12 thousand students and employees, and more than 600 teachers. University has 7 faculties: architectural, civil and environmental engineering, electrical engineering, computer science, mechanical engineering, management, forestry.

To combine the educational programs between the two universities «Learning Agreement» was signed where the objects studied in Poltava National Technical Yuri Kondratyuk University, were agreed with the following courses:

- Composite structures;
- Concrete for special applications;
- Concrete structures;
- Demolition;
- Steel structures;
- Structural mechanics;
- Timber and masonry structures;
- Foundations.

As it was shown by Poltava students, education in Poland is conducted at high level. Bialystok University of Technology has modern laboratories, a large number of qualified teachers, and easy access to academic resources.

During the time of the studies in Poland, Poltava students had the opportunity to see the University library (Fig. 1), built and funded by the European Union. It is one of the best libraries in Poland, allowing students full access to information from various sources. There, students are granted tranquil atmosphere to concentrate while doing essays and to relax in a special room.



Figure 1 – Modern library located on the area of University

The course «Concrete for special applications» consisted of two parts – theoretical and practical. The theoretical part was concluded by passing an exam. The practical part had a project called «Demolition of the house» which will be described later on.

In this course laboratory work was conducted, where were tested various types of admixtures and concretes (Fig. 2).



Figure 2 – Laboratory works from subject «Concrete for special application»

The next studied subject was concrete structures. It consisted of two parts – theory and practice. The theoretical part consisted of passing the exam at the end of the course. The practical part, on other hand, had a project, which included the calculation of reinforcements numbers for the slab and beam (Fig. 3). [1]

The lectures at the course were given by the member of the European Committee for standardization, Professor Victor Tur (Belarus, Brest).

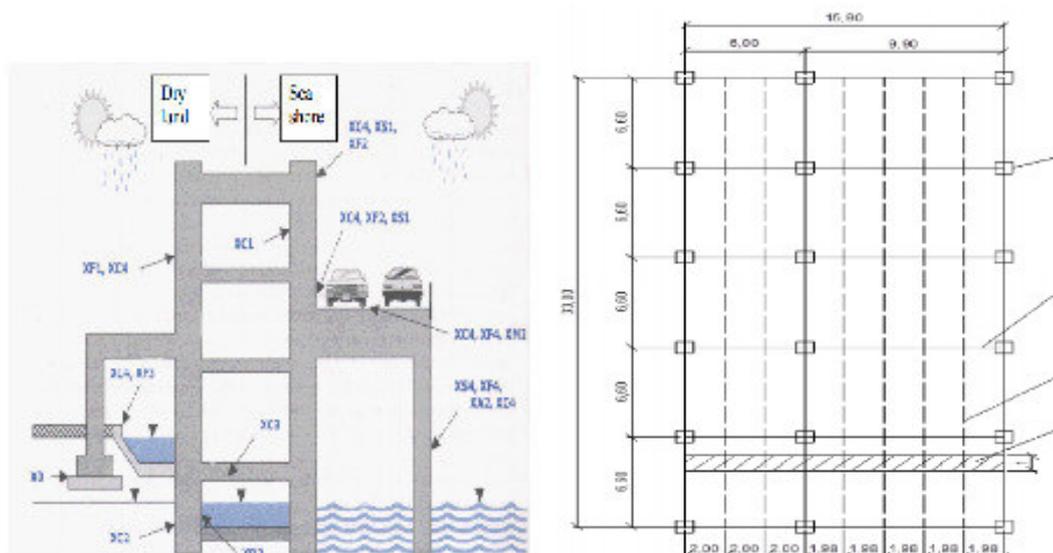


Figure 3 – Lectures and chemes for the project conducted in the course «Concrete structures»

At the course «Foundations» students designed the structures use of regulatory document - Eurocode 7. The course had only practical part which consisted of two projects – calculation of foundation based directly on the ground and calculation of the retaining wall (Fig. 4). [2]

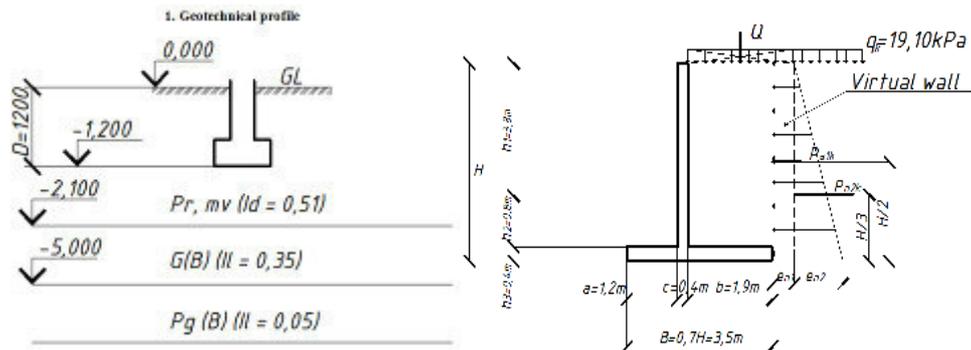


Figure 4 – Main schemes in the projects from discipline «Foundations»

During the Timber and Masonry course lectures were delivered. At the end of lectures students passed the exam, and project which consisted of two parts – the calculation of timber truss and brick walls, that perceived the load from the truss and roofing. The calculation required the use of the normative documents – Eurocode 5 and Eurocode 6 (Fig. 5). [3; 4; 5; 6]

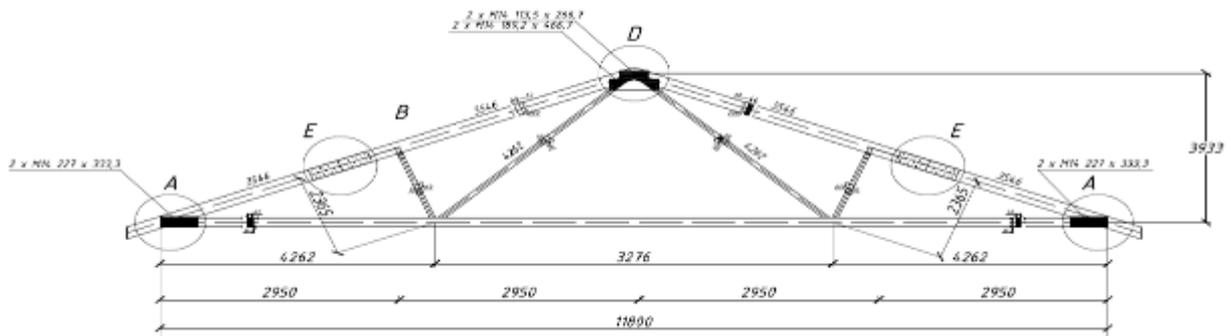


Figure 5 – Timber truss in the project «Timber and masonry structures»

At the Steel structures course students were asked to submit calculated project, which consisted of three parts – steel beam calculation, steel column calculation and calculation of connection between beam and column. The calculations were provided according to Eurocode 3 (Fig. 6,7) [7].

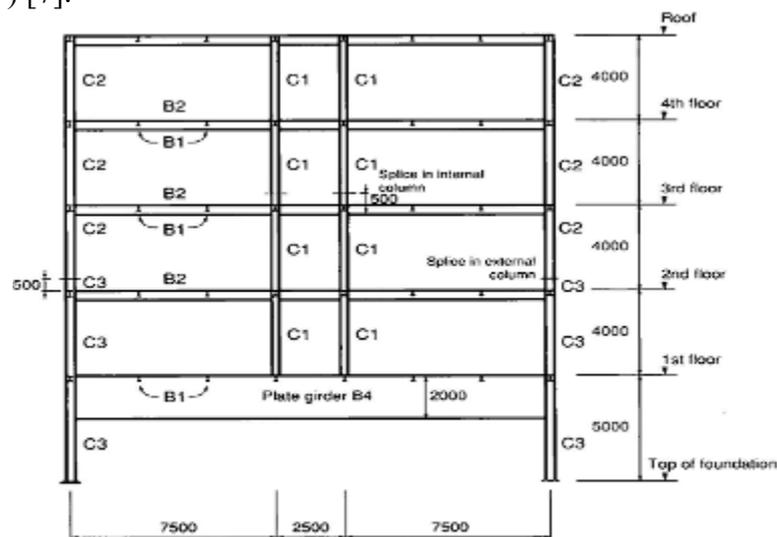


Figure 6 – Cross-section of the building in the project of «Steel structures»

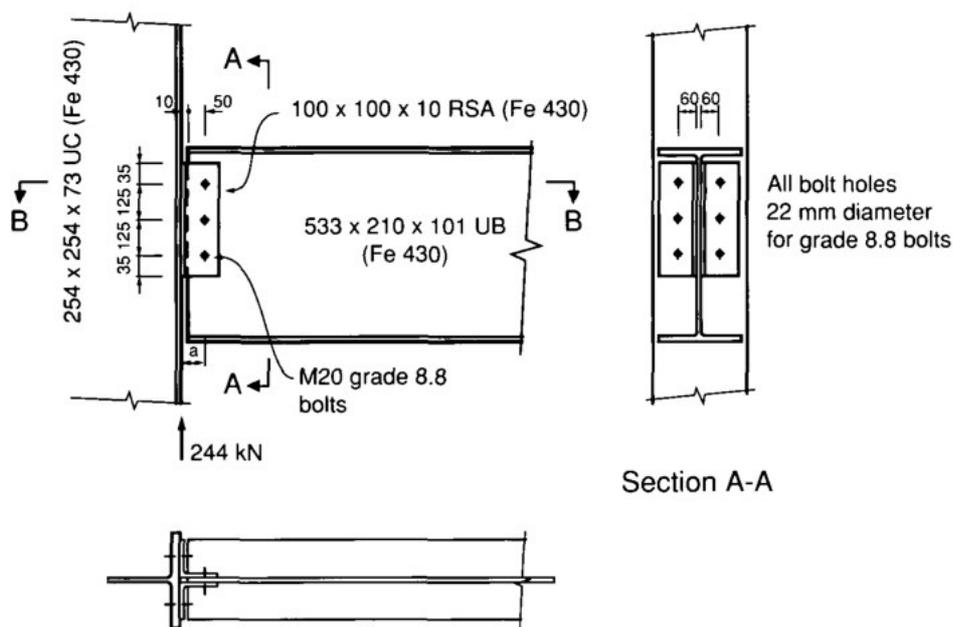


Figure7 – Typical joints in the Steel Structures project

The discipline «Structural mechanics» in Bialystok University of technology was aimed to familiarize students with calculation of systems by force method. This method was presented during the lectures. Lectures were conducted by two teachers using a variety of methods to display the information (Fig. 8).

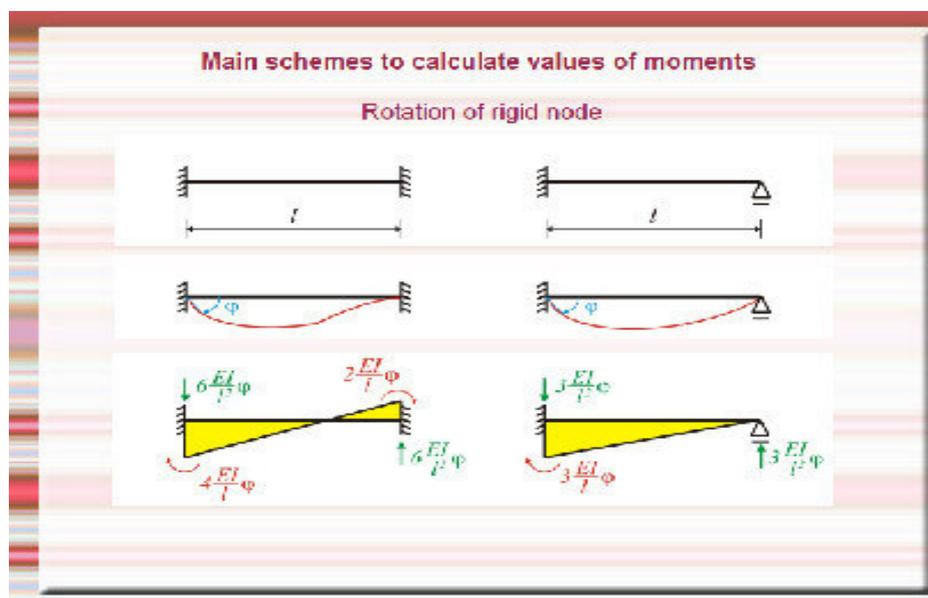
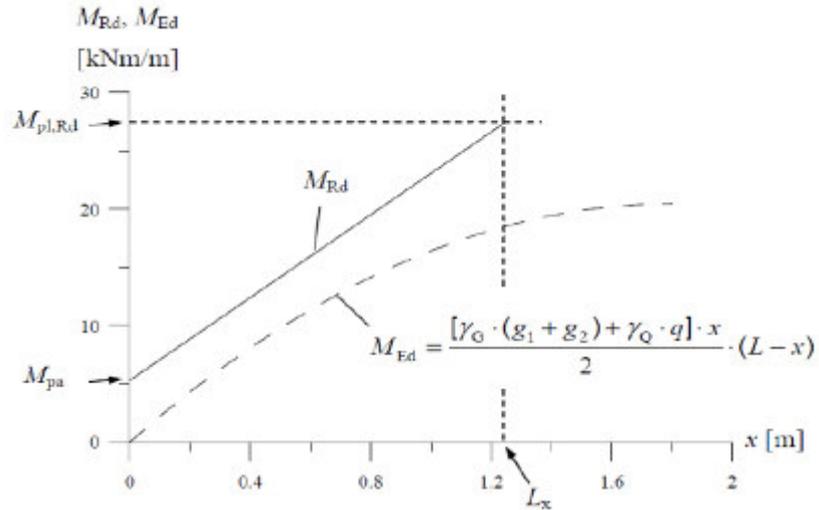


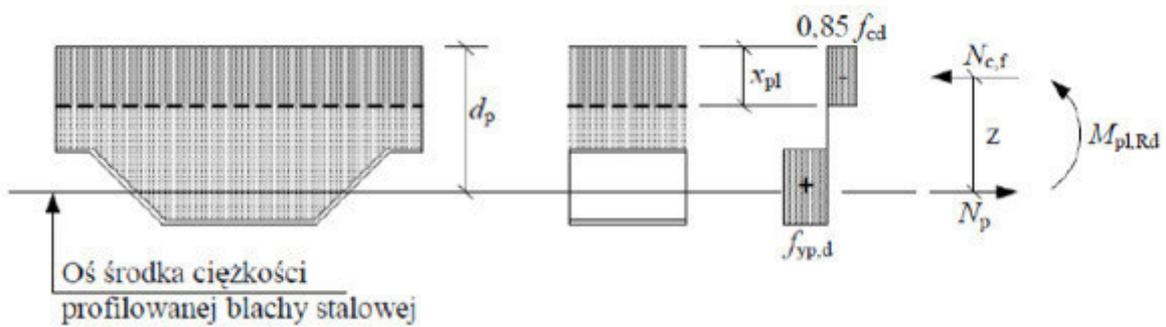
Figure 8 – Fragment of a lecture at the subject «Structural mechanics»

The subject of «Composite structures» consisted of theoretical and practical parts. For the practical part a project was submitted, which consisted of the composite slab calculation. Design consisted of slab loadings calculations and displacements. It was provided according to Eurocode 3 and Eurocode 4 (Fig. 9) [7; 8] .

a)



b)



c)

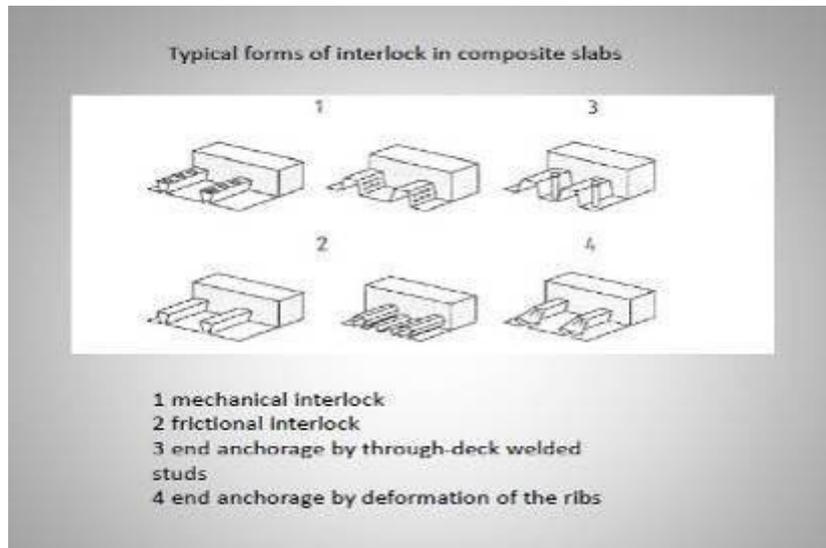


Figure 9 – Pictures in the discipline «Composite structures»:
 A and B – calculation of composite slab; C – fragment of lecture.

As it was noted previously, the course of «Concrete for special applications» had a practical part, where the projects on the topic «Demolition of building» were issued. The main idea of it was to select an appropriate method of building demolition – mechanical or explosive. It was necessary to enforce safety precautions when performing the work. After that it was also necessary to make the classification and to calculate the amount of materials remaining after the demolition. In the case of the houses made of concrete it was necessary to ensure the selection of appropriate technology for the separation of aggregate from the «cement paste». Then, after the separation, to enforce using of the wastes again in the manufacture of concrete. During the design it was appropriate to make use of Internet sources and Polish waste catalogue.

It is advisable to specify particular aspects of education in Poland and to compare them with Ukrainian ones. In reference to educational process in general, before studying at the University each student is required to pass Polish national entrance examination called «matura». This exam is held every year in May. This includes: a mandatory test of Polish language, mathematics and one foreign language and specialized subjects required for the admission (for example, in civil engineering – physics or chemistry). The second step is selection: each student who passed the «matura», needs to visit the website of University and sign up. Then the admission makes a ranking of students according to their scores. The third and the last step after the students list announcement is the filling of all documents. Student enrollment is conducted in three waves.

Analyzing the above, it can be concluded that the process of admission to Polish university is similar to the process in Ukraine. [9]

Throughout the term Polish full-time students must write two colloquiums, or to carry out projects, and report in laboratory works. The projects of Polish students have more theoretical content, they, unlike the Ukrainian, contain a small amount of drawing material and designing directly in the classroom.

During the term each Polish student must score 30 points, this number is the same for all disciplines. To take the exam on a particular subject, a student must score at least 20 points. In the case, if the number of points is less, then, at least one subject must be recurred the entire academic year after paying to the University the appropriate amount of money.

In first year of studying Polish civil engineering students have similar to Ukrainian students disciplines such as higher mathematics, physics, chemistry, engineering, geodesy, informatics, and descriptive geometry.

Holidays in Polish Universities usually start after final exams in July, sometimes at the end of June (depends on schedule). The new academic year in Poland, unlike in Ukraine, starts in late September. If a Polish student has not passed the exams during the summer session, he/she has another chance during the first days of September. If the examination has been successfully passed, he/she keeps their scholarship if they had one. Also Polish students have a few days off during New year and Easter (Orthodox and Catholic holidays), on the eve of holidays classes are usually shortened do.

Part-time students in Polish University have almost the same education process as full-time students. There are only two differences. Students must pay for the education, the amount depends on the speciality (technical speciality usually cost more than humanitarian). Part-time students have classes only at the weekend.

In the end it is appropriate to say that learning processes in Poland and in Ukraine are similar, as they include 30 credits but differ in the way of course project implementation. In Ukraine there are 2-3 dimensional projects from the major disciplines and in Poland there are dimensional projects for each subject, which are carried out directly in the classroom.

Conclusions.

1. Studying in the Bialystok University of Technology showed what the European educational process, design standards, and implementation of projects and experiments are like.

2. Projects in Polish Universities have a significant amount of calculations and a smaller amount of drawing material.

3. Acquired knowledge in the insight and application of standards of the Eurocode in the future can be used for new projects designing and master's degree diploma in Poltava National Technical Yuri Kondratyuk University.

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