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Report on the implementation of the LLL program "Industrial pneumatic automation and mechatronics. Main level" in KEnEU

ACTIVITY PERIOD 04/04/2022-08/04/2022

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Abstract	This is a narrative report on the implementation of the LLL program for current professionals in the field of industrial automation and robotics in KEnEU from April 04 to April 08, 2022, which also includes the results of feedback after training.
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Activity Report

In the period 04/04/2022-08/04/2022 on the basis of the Kostanay Engineering and Economics University named after M. Dulatov the LLL program for employees of enterprises of the Kostanay region was organized and conducted on the topic "Industrial pneumatic automation and mechatronics. Basic level" in the amount of 36 hours.

Within the framework of the course, the topics of lectures and practical work were considered according to Table 1.

Table 1. Content of the LLL program

№	The content of the discipline (topic or section)	Number of hours		
		Total	including	
			Lecture	Practice
1 module				
1	Introduction to FluidSIM - overview of components and functions	1	1	
2	Symbols of pneumatic devices, creation of circuit diagrams. International Standards.	1	1	
3	Control system: pneumatic distributors of various types (structure, types and purpose of pneumatic distributors), sensors, throttles, logic elements. Pneumatic systems using multiple cylinders.	2	1	1
4	Schemes with one actuator Schemes with multiple actuators	2		2
5	Block diagram of work, communication FluidSim with the controller	2		2
2 module				
1	Distribution station: disassembly / assembly of mechanics, programming according to WSI standards.	2	1	1
2	Sorting station: mechanical disassembly/assembly, traffic light programming.	2		2
3	Transfer station: disassembly/assembly of mechanics, traffic light programming on SIM-box.	2		2
3 module				
1	Stations overview: 1.Handling Station 2.MeasuringStation 3.JoinigStation 4.PackagingStation.	2	2	
2	Introduction to TIAPortal - an overview of the components and functions. Project creation, hardware and network configuration.	4	1	3

3	Overview of programming: basic functions, addressing, variables. Working with organization blocks (interrupts, error handling, startup type). Code Creation.	4	1	3
4	Logic programming of industrial controllers, logical operators. Data input-output. Basics of LAD, controller S7-300 313C-2 DP, simulation.	2		2
5	Working with memory and data types. Timers in programming Siemens industrial controllers. Independent work, programming of the operator panel. Counters and work with them. Counter - an element for measuring the quantity.	2	1	1
6	Processing station WSI programming.	4	1	3
7	Measuring station WSI programming.	4	1	3
Total		36	11	25

The list of trained specialists is presented in Table 2.

Table 2. List of LLL students.

№	Full name	Organization	Position
1	Abylgazimov Ruslan Serikovich	LLP "Service Center" Rostselmash"	Service Engineer
2	Babakulov Rifat Isroilovich	Rudny Branch branch of LLP "Firm" Arasan "	APCS Engineer
3	Budylin Maxim Yurievich	Rudny Branch branch of LLP "Firm" Arasan "	Electrical locksmith
4	David Nemolchev Dmitrievich	IP "Bolshevichka"	General worker
5	Kappasov Damir Zhaksybaevich	LLP "BK-Beton"	CNC plasma machine operator
6	Karasev Georgy Sergeevich	LLP "SaryarkaAvtoProm"	Mechanic of instrumentation and automation
7	Melnikov Alexander Sergeevich	Aqua Arasan LLP	Technological equipment mechanic
8	Mikhailov Sergey Anatolievich	LLP "BK-Beton"	Electrician

9	Sarsembaev Bauyrzhan Kairzhanuly	LLP "Service Center "Rostselmash"	Service Engineer
10	Sokolov Anton Leonidovich	LLP "BK-Beton"	Foreman

During the analysis and consolidation of theoretical and practical skills, students mastered the FluidSim and TIA Portal software packages - an overview of components and functions, project creation, equipment and network configuration.

It was not difficult to work out the practical part of the pneumatics module, since many enterprises of the Kostanay region, such as Aqua Arasan LLP, Rudny branch of LLP Arasan Firm, LLP Rostselmash SC, IP Bolshevichka are already working on such equipment.

Students experienced difficulties when completing tasks in the FluidSim program, since the FluidSIM software package is designed to simulate pneumatic and electro-pneumatic systems at the stage of making a circuit design solution, the simulated system is represented by a diagram in conventional graphic symbols (symbols).

As a result of passing the 1st module were:

- Pneumatic automation systems, which are one of the main classes of industrial automation systems, have been studied.

- the integration of electrical and pneumatic automation devices, which play an important role in solving many problems associated with the development and implementation of modern mechatronic equipment, has been worked out.

The system architecture of the new generation of SIMATIC S7-1200 and S7-1500 controllers has been updated and, using the TIA Portal, these innovations provide advantages in programming and configuring the controllers.

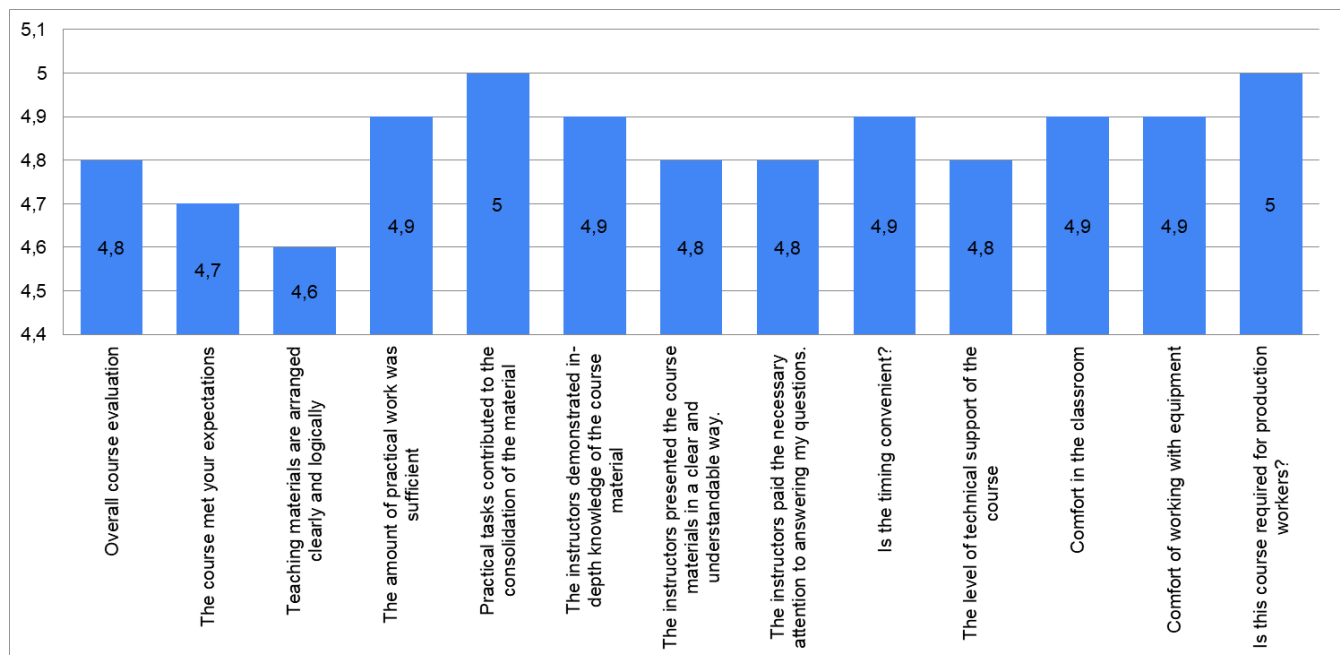
This program has worked out recommendations and tips for efficient programming of S7-1200/1500 controllers, as well as new programming opportunities.

Course participants acquired and shared their experience in programming controllers. The use of controllers in practice is carried out at the enterprises of SaryarkaAvtoProm LLP, Aqua Arasan LLP, Branch Rudny branch of LLP Arasan Firm, BK-Beton LLP, Rostselmash Service Center LLP, IP Bolshevichka.

Feedback results

At the end of the course, a survey was conducted, in which the students proposed to increase the duration of the program, differentiate courses according to the level of complexity, and make additional purchases of consumables for practicing the practical tasks of the course. The questionnaire contained questions on 13 criteria for evaluating the program on a 5-point scale. The average score for each criterion is shown in Diagram 1.

Diagram 1. Evaluation of the LLL program by students.



Based on the results of the survey, we can conclude that the LLL program is implemented with high quality, is relevant and in demand by professionals in the field of industrial automation and robotics.