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Report on the implementation of the LLL program "Fundamentals of pneumoautomatics and mechatronics for employees of educational systems" at KEnEU

ACTIVITY PERIOD 13/06/2022-24/06/2022

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Abstract	This is a narrative report on the implementation of the KEnEU LLL program for teachers of disciplines in the field of industrial automation and robotics in the period from June 13 to 24, 2022, which also includes the results of feedback after training.
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Activity Report

In the period 13/06/2022-24/06/2022, on the basis of Kostanay Engineering and Economics University named after M. Dulatov, an LLL program was organized and conducted for teachers of disciplines in the field of industrial automation and robotics on the topic "Fundamentals of Pneumoautomatics and mechatronics for employees of educational systems" in the amount of 72 hours.

The course covered the topics of lectures and practical work according to Table 1.

Table 1. Contents 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	2	2	
2.	Symbols of pneumatic devices, creation of schematic diagrams. International standards	1	1	
3.	Control system: pneumatic distributors of various types (structure, types and purpose of pneumatic distributors), sensors, chokes, logic elements. Pneumatic systems using multiple cylinders	2	1	1
4.	To develop a practical task for students in pneumoautomatics using the FluidSIM software package	5		5
5.	Circuits with a single actuator Circuits with multiple actuators	2		2
6.	Block diagram of operation, FluidSIM communication with the controller	2		2
7.	To develop a practical task for students in pneumoautomatics using the FluidSIM software package	5		5
2 module				
1.	Distribution station: disassembly/assembly of mechanics, programming according to WSI standards	2	1	1
2.	Sorting station: disassembly/assembly of mechanics, traffic LIGHT programming	2		2
3.	Transfer station: disassembly/assembly of mechanics, traffic LIGHT programming on SIM-box	2		2
4.	To develop a practical task for students in	5		5

	pneumoautomatics using a SIM-box			
3 module				
1.	Station overview: 1.Handling Station 2.MeasuringStation 3.JoinigStation 4.PackagingStation.	2	2	
2.	Introduction to TIAPortal – overview of components and functions. Project creation, configuration of equipment and networks	4	1	3
3.	Programming overview: basic functions, addressing, variables. Working with organizational blocks (interrupts, error handling, startup type). Creating program code	4	1	3
4.	Logical programming of industrial controllers, logical operators. Data input/output. Basics of LED, S7-300 313C-2 DP controller, simulation	2		2
5.	To develop a practical task for students in mechatronics using the TIA Portal	5		5
6.	Working with memory and data types. Timers in the programming of Siemens industrial controllers. Independent work, programming of the operator panel. Counters and working with them. Counter – an element for measuring quantity	2	1	1
7.	To develop a practical task for students in mechatronics using the TIA Portal	5		5
8.	Processing station programming according to WSI standards	4	1	3
9.	Measurement station programming according to WSI standards	4	1	3
10.	Learn more about WORLDSKILLS	5	5	
11.	WORLDSKILLS Requirements	5		5
Total		72	21	51

The list of trained teachers is presented in table 2.

Table 2. List of students of the LLL program.

№	Full name	Educational institution	Position
1	Irgibayeva Dinara Kairatovna	MSOE "Kostanay Polytechnic Higher College"	Lecturer of special disciplines

2	Zhunosov Kuat Muratovich	PI "Kostanay Engineering and Economics University named after M. Dulatov"	Docent
3	Abiltaev Dastan Samatuly	NAE "Kostanay Regional University named after A. Baitursynov"	Lecturer
4	Li Evgeniya Igorevna	NAE "Kostanay Regional University named after A. Baitursynov"	Lecturer
5	Uderbaeva Nurgul Kalievna	PI "Kostanay Engineering and Economics University named after M. Dulatov"	Senior lecturer
6	Ergalieva Gulzhanat Sarkytovna	NAE "Kostanay Regional University named after A. Baitursynov"	Senior lecturer
7	Nurpeisova Zhanar Sembayevna	NAE "Kostanay Regional University named after A. Baitursynov"	Senior lecturer
8	Gerauf Inna Ivanovna	PI "Kostanay Engineering and Economics University named after M. Dulatov"	Senior lecturer
9	Boshanova Nurgul Maratovna	PI "Kostanay Engineering and Economics University named after M. Dulatov"	laboratory assistant
10	Zhuaspaev Talgat Amangildinovich	PI "Kostanay Engineering and Economics University named after M. Dulatov"	Senior lecturer
11	Kazova Ainur Koishykovna	PI "Kostanay Engineering and Economics University named after M. Dulatov"	Lecturer
12	Shchukin Yuri Viktorovich	MSOE "Kostanay Polytechnic Higher College"	Master of Vocational Training
13	Shindavletov Artem Salimovich	PI "College of Entrepreneurship of KEnEU "	Lecturer of special disciplines
14	Januzakova Aigerim Nurzhanovna	PI "College of Entrepreneurship of KEnEU "	Lecturer of special disciplines
15	Amirhamzina Bakyt Kasengaliyevna	MSOE "Kostanay Polytechnic Higher College"	Lecturer of special disciplines

16	Kaipbaeva Zhuldyz Shamilyevna	MSOE "Kostanay Polytechnic Higher College"	Deputy Director for Educational and Methodological Work
17	Musina Madina Dauletzhanovna	Kostanay Higher College of Kazpotrebsoyuz	Lecturer
18	Naurzbayeva Kamila Bolatbekovna	Astana IT University	Student
19	Kayrekenova Nazerke Rashidovna	Al-Farabi Kazakh National University	Student
20	Keneshov Dulat Duisenbekovich	MSOE "Kostanay Polytechnic Higher College"	Lecturer of special disciplines

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

The FluidSIM program 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). The students were presented in detail the program, its advantages and disadvantages, the possibility of using equipment and programs in practical classes in disciplines in the field of industrial automation and robotics. As part of the course, the students developed guidelines for the disciplines of the educational programs "Automation", "Automation, Telemechanics and Management of Railways", "Technology of Mechanical Engineering (by type)"

As a result of passing the 1 module:

- 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 was worked out, which play an important role in solving many problems associated with the development and implementation of modern mechatronic equipment.

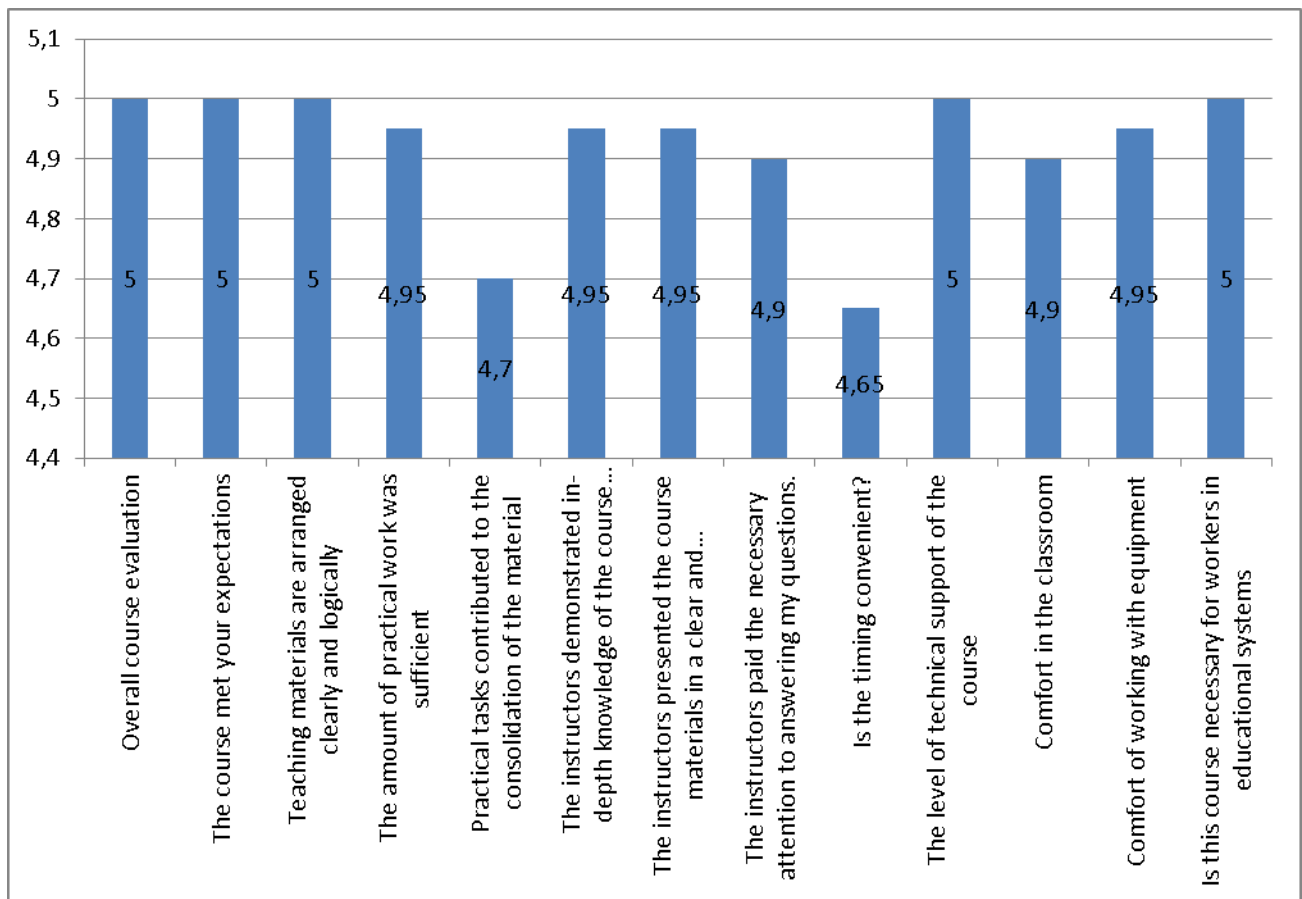
The system architecture of the new generation of SIMATIC S7-1200 and S7-1500 controllers has been updated and, using the TIA Portal, these innovations provide advantages in programming and configuring the controllers. The TIA Portal not only integrates the basic software STEP 7, WinCC, SINAMICS StartDrive, SIMOCODE ES and SIMOTION SCOUT TIA, but also new functionalities such as Multiuser Engineering and energy monitoring in one interface. In this course, recommendations and tips for efficient programming of S7-1200/1500 controllers have been worked out, as well as new features in programming.



Feedback results

At the end of the course, a survey was conducted, in which the students proposed to conduct these courses on an ongoing basis twice a year. 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 Chart 1.

Chart 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 teachers of universities and colleges.