



**Modernization of Mechatronics and Robotics for Bachelor degree in  
Uzbekistan through Innovative Ideas and Digital Technology**

609564-EPP-1-2019-1-EL-EPPKA2-CBHE-JP

## **MechaUZ\_D.4.1\_Establishment of I-LABs, Center and Mechatronics Society\_V.1**

Project Acronym:	MechaUZ
Grant Agreement No.	609564
Deliverable Editor(s)	Andijan machine-building institute (Uzbekistan)
Dissemination level:	National (Consortium Internal)



## Revision History

Version	Date	Organisation	Author	Changes
V 1.0	13/03/2023	AndMI	Javlonbek Rakhmatillaev	Provision of Structure and content

## Document Contact Information

Name	Organization	Contact information
Javlonbek Rakhmatillaev	AndMI	<a href="mailto:javlonbiy0286@gmail.com">javlonbiy0286@gmail.com</a>

## Approval Table

Version	Date of Approval	Deliverable Name	Approved By
V 1.0	12/10/2023	MechaUZ_D.4.1_Establishment of I-LABs, Center and Mechatronics Society_V.1	Alvis Sokolovs, ViA Duarte Alves, IPVC Alibek Eshev, KEEI



### List of MechaUz Partners

Partner No	Country	Legal name
P1	Greece	<a href="#"><u>International Hellenic University (IHU)</u></a>
P2	Greece	<a href="#"><u>KENTRO EREVNON NOTIOANATOLIKIS EVROPIS ASTIKI MI KERDOSKOPIKI (SEERC)</u></a>
P3	Lithuania	<a href="#"><u>Vilnius Gediminas Technical University (VGTU)</u></a>
P4	Latvia	<a href="#"><u>Liepāja University (LIEPU)</u></a>
P5	Latvia	<a href="#"><u>Vidzeme University of Applied Sciences (ViA)</u></a>
P6	Portugal	<a href="#"><u>Polytechnic Institute of Viana do Castelo (IPVC)</u></a>
P7	Uzbekistan	<a href="#"><u>Andijan Machine-Building Institute (AndMI)</u></a>
P8	Uzbekistan	<a href="#"><u>Turin Polytechnic University in Tashkent (TTPU)</u></a>
P9	Uzbekistan	<a href="#"><u>Fergana Polytechnic Institute (FPI)</u></a>
P10	Uzbekistan	<a href="#"><u>Tashkent University of Information Technology (TUIT)</u></a>
P11	Uzbekistan	<a href="#"><u>Karshi Engineering Economics Institute (KEEI)</u></a>
P12	Uzbekistan	<a href="#"><u>Tashkent State Technical University (TSTU)</u></a>
P13	Uzbekistan	<a href="#"><u>The Ministry of Higher and Secondary Special Education of the Republic of Uzbekistan</u></a>



## Table of Contents

Executive Summary.....	5
1. Overview.....	5
1.1. Objectives and expected results of the project.....	5
1.2. Objectives and definition of Establishment.....	6
1.3. Concept and methodology.....	7
2. Customs clearance procedure.....	9
3. Establishment of the innovative laboratories.....	11
3.1. P7_Andijan machine-building institute.....	12
3.2. P8_Turin Polytechnic University in Tashkent.....	14
3.3. P9_Fergana Polytechnic Institute.....	17
3.4. P10_Tashkent University of Information Technology.....	19
3.5. P11_Karshi Engineering Economics Institute.....	21
3.6. P12_Tashkent State Technical University.....	24
4. Establishment of Training Centre.....	26
5. Mechatronics Society of Uzbekistan.....	28



## Executive Summary

The document has been prepared for internal use within the [Work Package 4 – ESTABLISHMENT](#) by Andijan machine-building institute in collaboration with Vidzeme University of Applied Sciences and is supported by the project coordinator – International Hellenic University (IHU, Greece) and all project partners. It is an overall establishment report for the MechaUZ project, and it will provide the project partners with all necessary details and tools to establish the iLabs, Training Center and Society in all project activities. The receiving audience are all projects partners that will make use of the document to produce content during the project’s lifetime.

AndMI has the overall Management of WP4 in collaboration with ViA.

### 1. Overview

The main aim of the [MechaUZ project](#) is to develop bachelor’s degree program in the field of Mechatronics. This project comes as a solution to the need of developing the higher education capacity & offerings in Uzbekistan in the field of Mechatronics. The main objective of the program is to develop a continuous education program to train a new generation of engineers well capable of performing constructive engineering works and meeting today’s technological challenges by developing a new curriculum.

Besides, Establishment of I-LABs, Center and Mechatronics Society are another noble elements of this project (relying on Industry 4.0 & Education 4.0). Even though, the benefits of international societies and communities promoting the quality of education, research and development are enormous, involvement of Uzbek HEIs in international scientific communities has been very inert and rare.

#### 1.1. Objectives and expected results of the project

Aims of the project will be reached through building up following objectives of the project:

- Developing and implementing a new scheme of cooperation for university-industry links based on EU skills in Mechatronics sphere;
- Developing standards and curricula, courses, teaching methods, materials and tools (soft skills) in the field of Mechatronics;
- Developing and implementing new courses for teachers, staff and engineers of the enterprises;



- Training teachers from HEIs in Uzbekistan with teaching methodologies based on Mechatronics at EU partner universities;
- Developing and publishing a new generation of handbooks/manuals for direction of Mechatronics;
- Establishing the Innovation laboratories (I-LAB), Training Centre and Mechatronics Society of Uzbekistan for disseminate the results of project;
- Testing, adapting and accrediting curriculum, materials and methods;
- Transferring the recommendations of the new model of education system to other sectors of the Uzbek economy.

This objective is achieved from following outcomes:

- Creating a new BSc program with complete curricula and teaching materials at AndMI, TTPU, TSTU, FPI and KEII. Main outcomes of the project will be a full Bachelor of Science curriculum with 12 courses compatible with European standards and 3 training courses for teachers, staffs and engineers;
- Training teachers from UZB HEIs with teaching methodologies based on Mechatronics at EU partner universities;
- Establishing 6 I-LABs at all UZB HEIs equipped with specialized equipment using the best practices of EU, principally ViA
- Establishing the Training Centre for teachers of special subjects and engineers to use the new laboratory equipment and Mechatronics Society for promoting research, development and engineering science in the field of Mechatronics at AndMI.
- developing and implementing the new scheme of cooperation for university-industry links based on EU skills in Mechatronics sphere.

## 1.2. Objectives and definition of Establishment

Establishment is the main innovative point of the project. The objectives of the Establishment:

- **I-LABs.** They will be equipped with specialized laboratory technologies utilized in EU HEIs and will serve not only the undergraduate students but also graduate students, researchers and teachers and will support the knowledge cycle: training-teaching-innovation. The lab equipment will be selected based on the outcomes of conducted need analysis of industrial enterprises and as well as respective HEIs. Therefore, the list of necessary equipment,



software and devices will be prepared, reviewed and approved by the beneficiary HEIs. Upon approval selected equipment and devices will be installed and lab experiments will be conducted;

- **Training Centre** will provide further need based education and support the training of students/researchers/engineers in HEIs of UZB and will be established at AndMI, Uzbekistan;

- **Mechatronics Society.** It will be established using the best practices of EU. The primary objective of the Mechatronics Society will be promoting research, development and engineering science in the field of Mechatronics and disseminate the results of project. The tasks are to design the structure of the mechatronics society and to develop the rules and regulations for administration and membership.

### 1.3. Concept and methodology

**The concept** of the i-Labs aims to establish an innovative laboratories based on modern mechatronic programs. During the establishment of the i-Labs, project team worked with [Quanser's company](#).

Quanser's company: By its nature, a mechatronics program relies heavily on hands-on experiences and labs. Microprocessor programming, sensor integration, or hobby robotics are all very typical kinds of labs that many institutions have introduced. A common lab sequence sees students programming hobby microprocessor boards and then connecting them to simple sensors to operate small motors, lights, or other components. Because of the use of hobby-grade components, often the essential learning challenge becomes the programming as opposed to the system, in addition to the programming.

In many cases, the lab sequence culminates in projects where students might build small hobby robots to perform a relatively complex task. The challenge is again, typically in programming to refine the smarts of the control software. The physical system itself remains relatively simple in configuration.

While the core curriculum sequence of most undergraduate engineering programs is based on modeling and analysis of complex physical systems using mathematical and scientific methods, the mechatronics lab sequences remain problematically disconnected from this core. Quanser's contribution in this context is to offer a learning platform that reconciles the traditional applied sciences with modern mechatronic technique.

Based on the mechatronic programs from different universities around the world that Quanser has reviewed and their collaborations with various institutions, they have listed the following courses that would make up a well-rounded, modern Mechatronics program:



- Fundamentals
  - Sensors
  - Actuators
  - Microprocessor Architecture
  - Embedded Programming
- Integration
  - Control Systems I – Classical Control
  - Control Systems II – Modern Control
  - Digital Control Systems
  - Robotic Manipulators and Mobile Robotics
  - Flight Dynamics and Control
  - Mechanical Design (CAD)
- Design
  - Senior Design Project

**The methodology** refers to a core philosophy of harmonization of key concepts and techniques that are quite often treated independently in a curriculum sequence. For mechatronics programs, the methodology focuses on the development of fundamental skills in a guided way that effectively prepares students to apply those skills in a more open ended project and design context. Additionally, it places significant emphasis on the inherent dynamics of engineering physical systems. In this way, the method differentiates itself from a programming-centric approach, and arguably is better at conceptually connecting to most of the courses in typical bachelor programs that are founded on engineering science, modeling, and mathematics.





## 2. Customs clearance procedure

[Customs clearance procedure of equipment purchased under the Erasmus+ projects](#) on Capacity Building of Higher Education (CBHE) in Uzbekistan is carried out by the higher education institution (HEI) of the Republic of Uzbekistan, identified as the National Coordinator of the project or by each involved HEI individually following the decision of the project consortium.

The Department for the Development and Monitoring of Investment Projects of the Ministry of Higher and Secondary Specialized Education (MHSSE), which coordinates the activities of grants, including the equipment purchase by Erasmus+ projects, assists project coordinators and ensures coordination of customs clearance and delivery of received equipment to all participating HEIs.

The beneficiary of the equipment received as part of the Erasmus+ CBHE grant project should be the Project Coordinator/university administration.

The project coordinator appoints a person responsible for the delivery and customs clearance of equipment arriving within the framework of the project.

The project coordinator promptly sends a request to MHSSE in order to obtain a certificate of the Ministry of Investments and Foreign Trade of the Republic of Uzbekistan (MIFT) to be further submitted to the State Customs Committee of the Republic of Uzbekistan (SCC) based on the following submitted documents:

- a) passport details of the responsible HEI staff member
- b) equipment specifications
- c) passport/project concept
- d) grant agreement of the project
- e) breakdown by final recipients of goods received under the project
- f) cargo customs declaration

MHSSE submits a request with all above-mentioned documents to MIFT in order to obtain a certificate on equipment related to technical assistance.

Based on the results of the review of the submitted documents in a prescribed manner, MIFT prepares a relevant certificate and sends it to the State Customs Committee, as well as copies to MHSSE and the Project Coordinator for information.



According to the current legislation, having received a certificate of MIFT, the State Customs Committee carries out customs clearance of equipment free of duty and taxes, including VAT.

Other costs associated with customs clearance (payment for service of declarants), handling and storage of equipment, as well as its certification, are covered in accordance with the current legislation and agreements between the project coordinator and the equipment supplier.

The Project Coordinator ensures the distribution and delivery of the received equipment to other involved partner universities in accordance with the grant agreement.



### 3. Establishment of the innovative laboratories (i-Labs)

[In the kick-off meeting](#) at IHU, the following activities of the establishment were confirmed by the all partners:

- the UZ partners should check the equipment they have listed and make any necessary changes;
- the Uz partners should do following activities themselves:
  - Selecting the list of equipment;
  - Selecting the offers and tendering procedure;
  - Make an agreement, transferring money and Customs clearance procedure of equipment purchased;
  - Installing the equipment;
  - Developing iLab materials and handbooks;
  - Organizing the opening ceremony.

Six i-Labs will be established at all Uzbek partners and will be equipped with specialized equipment using the best practices of EU based on following table. Budget for the equipment is equal 150 000 euros (25 000 euros for each partners).



### 3.1. P7\_Andijan machine-building institute

**Workplan** for the establishment at P7\_Andijan machine building institute

No	Activities of WP4	Tasks	Duration	Responsible person
1	Establishment of iLabs	<a href="#">Selecting the list of equipment</a>	25.07.2020-25.08.2020	J.Rakhmatillaev Yo.Kurbonov
		<a href="#">Selecting the offers and tendering procedure</a>	15.12.2020-15.01.2021	J.Rakhmatillaev
		Make an agreement, transferring money and Customs clearance procedure of equipment purchased	15.01.2021-30.12.2021	J.Rakhmatillaev
		Installing the equipment	01.10.2022-30.06.2022	J.Rakhmatillaev X.Asranov M.Begijanov
		Developing iLab materials and handbooks	30.06.2021-31.08.2023	J.Rakhmatillaev A.Yusupov

#### Equipment list for i-Labs at Andijan machine-building institute

I-LABS was established at Andijan machine-building institute and was equipped with specialized equipment using the best practices of EU based on following table. Budget for the equipment was equal 24 950,00 euros (CONTRACT between AndMI and SIA Olnio for the purchase and delivery of i-Lab equipment, No. OL-20-10-29-1,18/01/2021).

#	Title of the equipment	Parts of Equipment	Quantity required	Total Costs
1	NI ELVIS III	Cables & Probes, Power Cord	3	13,776.61
2	Quanser Mechatronics Sensors Board for NI ELVIS III	-	1	2125.48
3	Quanser Mechatronics Actuators Board for NI ELVIS III	-	1	2125.48
4	Quanser Mechatronics Systems Board for NI ELVIS III	-	1	2364.35
5	Quanser Controls Board for NI ELVIS III	-	1	2364.35
6	Digilent Digital Electronics for NI ELVIS III	-	3	2193.74



<b>Total</b>	<b>24 950.00</b>
--------------	------------------

**Courses** which organizing at i-Labs: There are 5 courses organized in i-Lab:

1. Automatic control theory
2. Design and control of robots in mechatronics
3. Electric drives
4. Fundamentals of robot programming
5. Mechatronic systems

**Total number of target groups** directly affected by the project i-labs:

Students (class)		Professors/Staff		Researchers		Others (please specify)	
Total	Female	Total	Female	Total	Female	Total	Female
220	30	12	3	8	3	35	9

[Opening ceremony](#) of i-Lab at Andijan machine-building institute was organized on 04 October, 2023, during the Final Conference of the project.

i-Lab named "["Mechatronics and robotics" laboratory](#)" was established under the department "Automation of mechanical engineering production" of the faculty "Intelligent management and computer systems" of the institute. The laboratory is 48 square meters and is fully equipped with electricity, water, heating and cooling, internet, and security.

During a last year (2023) more than 10 delegations (Examples: [Chinese delegation](#), [Mass-media](#), [Turkish delegation](#), [Korean delegation](#) and etc..) including students, researchers, teachers and administrative staffs visited and met the laboratory and center.



### 3.2. P8\_Turin Polytechnic University in Tashkent

**Workplan** for the establishment at Turin Polytechnic University in Tashkent

No	Activities of WP4	Tasks	Duration	Responsible person
1	Establishment of iLabs	<a href="#">Selecting the list of equipment</a>	15.05.2020-01.07.2020	J. Inoyatkhodjaev S. Asanov
		<a href="#">Selecting the offers and tendering procedure</a>	04.07.2020-09.07.2020	J. Inoyatkhodjaev S. Asanov
		Make an agreement, transferring money and Customs clearance procedure of equipment purchased	09.07.2020-10.11.2020	S.Asanov
		Installing the equipment	08.01.2021-08.02.2021	J.Inoyatkhodjaev S.Asanov J.Kholkhujaev
		Developing i-Lab materials and handbooks	08.06.2021-31.08.2023	S.Asanov F.Umerov

#### Equipment list for i-Labs at Turin Polytechnic University in Tashkent

I-LABS was established at Turin Polytechnic University in Tashkent and was equipped with specialized equipment using the best practices of EU based on following table. Budget for the equipment was equal to 25227 euros ( 25 000 euros from the project and 227 euros (2 761 675.19 UZS) from the university budget).

#	Title of the equipment	Parts of Equipment	Quantity purchased	Total Costs
1	Fishcerteknik conveyor simulator	Conveyor with two islands	20	8 700
2	PLC S7-1214C	Programmable Logic Controller for the conveyor simulator	20	5 266
3	Licence for the PLC, Installation and programming of the conveyor simulator	-	20	9 950
4	Kit Arduino Mobile	Electronic kit with Arduino and additional components	3	517. 83 <sup>1</sup>



		including motors,sensors,etc.		
5	Kit Arduino Basic	Electronic kit with Arduino and additional components including motors,sensors,etc	3	419.20 <sup>1</sup>
6	Electronic constructor Znatok	Electronic kit for teaching electronics	5	373.99 <sup>1</sup>
			<b>Total</b>	<b>25 227</b>

**Courses** which organizing at i-Labs: There are 4 courses organized in i-Lab:

1. Manufacturing processes (Use of PLC for industrial automation)
2. Basic and advanced PLC programming (for engineers working at factories)
3. Arduino development (elective course for students)
4. Mechatronics (for engineers working at factories)
5. Electronics, electric drives (for engineers working at factories)

**Total number of target groups** directly affected by the project i-lab:

Students (class)		Professors/Staff		Researchers		Others (students of Academic lyceum and engineers of industry)	
Total	Female	Total	Female	Total	Female	Total	Female
180	20	10	2	7	1	127	12

**Opening ceremony** of i-Lab at Turin Polytechnic University in Tashkent was organized on 19<sup>th</sup> September, 2022, during an International conference dedicated to the closure of an Erasmus+ CBHE project ELBA (<https://polito.uz/21079/>).

On July 9<sup>th</sup> 2020, TTPU signed a supply contract with SRL Media Direct (Italy) for equipment purchase to realize the goals of the MECHAUZ Erasmus+ project. The contract implied that 20 kits of “a simulator of Indexed Line with two machining stations 24V” by Fischertechnik (Germany) , together with 20 units of PLC S7-1215C controllers with a student license by Siemens would be provided.

After the arrival of the equipment in mid-November 2020, the customs clearance procedure started and it took about 3 months to complete it. Upon the completion of the customs



clearance, the installation phase started. By the end of March 2021, the equipment had been completely programmed and installed by Mangano Robot Srl (Italy).

In May 2021 TTPU launched a pilot course in PLC programming using the purchased equipment for second and third level students in the [i-Lab](#).





### 3.3. P9\_Fergana Polytechnic Institute

#### Workplan for the establishment at Fergana polytechnic institute

No	Activities of WP4	Tasks	Duration	Responsible person
1	Establishment of iLabs	Selecting the list of equipment	25.07.2020-25.08.2020	Sh. Abdullaev
		<a href="#">Selecting the offers and tendering procedure</a>	15.12.2020-15.01.2021	Y.Khusanov
		Make an agreement, transferring money and Customs clearance procedure of equipment purchased	15.01.2021-30.12.2021	N.Ismailov
		Installing the equipment	01.10.2022-30.06.2022	Sh. Abdullaev Y.Khusanov N.Ismailov E.Mamurov
		Developing iLab materials and handbooks	30.06.2021-31.08.2023	E.Mamurov Y.Khusanov

#### Equipment list for i-Labs at Fergana polytechnic institute

I-LABS was established at Fergana polytechnic institute and was equipped with specialized equipment using the best practices of EU based on following table. Budget for the equipment was equal 22 181,50 euros (CONTRACT between FerPI and Lucas Nulle for the purchase and delivery of i-Lab equipment).

#	Title of the equipment	Parts of Equipment	Quantity required	Total Costs
1	Handling Robot Mover4 HD, 4 Axis, 500 g.	-	1	6 813.51
2	IMS Mounting plate for training robot	-	1	307.35
3	Interactive Lab Assistant: CRT10 Setting up training robots	-	1	567.03
4	Workpiece, top section, white	-	1	74.05
5	Workpiece, top section, black	-	1	74.05
6	Workpiece, bottom section, white	-	1	73.03



7	Workpiece, bottom section, black	-	1	73.03
8	UniTrain Interface with virtual instruments (Basic VI)	-	2	4 984.61
9	UniTrain Experimenter	-	2	626.88
10	UniTrain measurement accessories, shunts and connection cables	-	2	387.49
11	Course - Electric Machines 5: Stepper motors	-	1	1 879.62
12	Course - Electric Machines 6: Linear motors	-	1	3 946.91
13	Course - Electric Machines 7: BLDC/servo motors	-	1	2 179.88
14	UniTrain Component Kit, DC motor	-	1	27.69
15	UniTrain-I Breadboard system with cable set (140 pcs)	-	1	166.37
<b>Total</b>				<b>22,181.50</b>

**Courses** which organizing at i-Labs: There are 3 courses organized in i-Lab:

1. Fundamentals of mechatronics
2. Robots and robotic systems
3. Modern robots and industrial robots.

**Total number of target groups** directly affected by the project i-labs:

Students (class)		Professors/Staff		Researchers		Others (please specify)	
Total	Female	Total	Female	Total	Female	Total	Female
50	6	4	0	8	0	23	6

[The Mechatronics and Robotics Laboratory](#) was officially declared open in September 2021 and has been made available to students majoring in [Mechatronics and Robotics](#). During the last year an AI specialist Hamid Ekbia, a professor of Indiana University, visited to institute who gave lectures and seminars at the Institute for 6 weeks. Lectures were mainly be concentrated on AI in Mechatronics and robotics. More than 45 Robotics and mechatronics students were participating his lectures.



### 3.4. P10\_Tashkent University of Information Technology

#### Workplan for the establishment at Tashkent University of Information Technology

No	Activities of WP4	Tasks	Duration	Responsible person
1	Establishment of iLabs	Selecting the list of equipment	25.07.2020-25.08.2020	H.Khujamatov, D.Khasanov
		<a href="#">Selecting the offers and tendering procedure</a>	25.08.2020-28.08.2020	U.Khamdamov
		Make an agreement, transferring money and Customs clearance procedure of equipment purchased	01.01.2021-20.02.2021	U.Khamdamov N.Akhmedov
		Installing the equipment	01.03.2021-30.06.2021	D.Khasanov, N.Akhmedov, E.Reyfnazarov
		Developing i-Lab materials and handbooks	01.07.2021-31.08.2023	H.Khujamatov, D.Khasanov, N.Akhmedov, E.Reyfnazarov

#### Equipment list for i-Labs at Tashkent University of Information Technology

I-LABS was established at Tashkent University of Information Technology and was equipped with specialized equipment using the best practices of EU based on following table. Budget for the equipment was equal to 24 204,29 euros.

#	Title of the equipment	Parts of Equipment	Quantity required	Total Costs
1	NI ELVIS III	Cables & Probes, Power Cord	3	13806,03
2	Quanser Mechatronics Sensors Board for NI ELVIS III	-	1	1969,00
3	Quanser Mechatronics Actuators Board for NI ELVIS III	-	1	1969,00
4	Quanser Mechatronics Systems Board for NI ELVIS III	-	1	2187,63
5	Quanser Controls Board for NI ELVIS	-	1	2187,63



	III			
6	Digilent Digital Electronics for NI ELVIS III	-	3	2085,00

**Courses** which organizing at i-Labs: There are 4 courses organized in i-Lab:

1. Fundamentals of Mechatronic Actuators
2. Mechatronic Systems Analysis
3. Fundamentals of Mechatronic Sensors
4. Control Systems Design and Analysis

**Total number of target groups** directly affected by the project i-lab:

Students (class)		Professors/Staff		Researchers		Others	
Total	Female	Total	Female	Total	Female	Total	Female
30	10	10	1	4	1	12	3

In March 2021, in room A101 of the central building of the Tashkent University of Information Technologies to open [i-Lab room](#). According to the order of the Rector of the University No. 274 dated 02.03.2021, this room was allocated for the organization of a laboratory room on "Mechatronics and Robotics" and provided with appropriate equipment ([order is attached](#)).

On September 6, 2021, [opening ceremony of the training laboratory](#) was held with the participation of project participants, university leaders, teachers and students. From that moment on, laboratory classes and training seminars are conducted in the laboratory according to the lesson plan. For these purposes, methodological guidelines for laboratory measurements have been developed. In addition, the laboratory is equipped with powerful computers and high-speed Internet, which makes it possible to conduct interactive lessons.



### 3.5. P11\_Karshi Engineering Economics Institute

**Workplan** for the establishment at Karshi engineering-economics institute

No	Activities of WP4	Tasks	Duration	Responsible person
1	Establishment of iLabs	Selecting the list of equipment	25.07.2020-25.08.2020	S.Tojiboev M.Keldiyarova A.Eshev
		<a href="#">Selecting the offers and tendering procedure</a>	15.12.2020-15.01.2021	A.Eshev
		Make an agreement, transferring money and Customs clearance procedure of equipment purchased	15.01.2021-30.12.2021	A.Eshev
		Installing the equipment	01.10.2022-30.06.2022	S.Tojiboev M.Keldiyarova N.Kobilov
		Developing iLab materials and handbooks	30.06.2021-31.08.2023	A.Eshev M.Keldiyarova

#### Equipment list for i-Labs at Karshi engineering-economics institute

I-LABS was established at Karshi engineering-economics institute and was equipped with specialized equipment using the best practices of EU based on following table. Budget for the equipment was equal 22 181,50 euros (CONTRACT between KEEI and LUCAS-NULLE for the purchase and delivery of i-Lab equipment, No. RE0011368,08/06/2021).

#	Title of the equipment	Parts of Equipment	Quantity required	Total Costs
1	LM9690	Robotic arm 4 HD, 4 axes, 500g Net weight: 10.00kg Customs tariff number: 90230010	1	6761,17
2	LM9695	IMS Mounting Plate for Training Robot Net Weight: 1.80kg, Customs Tariff Number: 84798997	1	305,21
3	SO2800-4P	Interactive Lab Assistant: CRT10, Training Robot Setup, Net Weight: 0.50kg, Customs Tariff Number: 85234910	1	562,83
4	LM9521	Blank, top, white, Net weight: 0.30 kg,	1	75,53



		Customs tariff number: 90230010		
5	LM9522	Blank, top, black Net weight: 0.30 kg, Customs tariff number: 90230010	1	75,53
6	LM9524	Blank, bottom, white, Net weight: 0.30 kg, Customs tariff number: 90230010	1	74,49
7	LM9525	Blank, lower part, black Net weight: 0.08 kg Customs tariff number: 90230010	1	74,49
8	CO4203-2A	UniTrain Interface with Virtual Instruments (Basic VI) Net Weight: 4.20 kg Customs Tariff Number: 90230010	2	4947,5
9	CO4203-2B	Experimenter UniTrain Net weight: 2.00 kg Customs tariff number: 90230010	2	622,83
10	CO4203-2J	Measuring accessories, shunts and connecting cables UniTrain Net weight: 1.00 kg Customs tariff number: 90230010	2	382,81
11	CO4204-7W	Course - Electrical Machines 5: Stepper Motors Net Weight: 1.50 kg Customs Tariff Number: 90230010	1	1917,13
12	CO4204-7X	Course - Electrical Machines 6: Linear Motors Net Weight: 5.20 kg Customs Tariff Number: 90230010	1	4025,66
13	CO4204-7Z	Course - Electrical Machines 7: BLDC/Servo Motors Net Weight: 1.00 kg Customs Tariff Number: 90230010	1	2163,37
14	SO4204-2Q	UniTrain component kit, DC motor Net weight: 0.20 kg Customs tariff number: 90230010	1	27,42
15	SO4203-2C	UniTrain-I Breadboard system with cable (140 pcs.) Net weight: 0.36 kg Customs tariff number: 90230010	1	165,53
16	Laptop HP	Laptop VICTUS HP, Core I 5, RAM 8GB, SSD 256 GB	1	833,8
17	Laptop HP	Laptop HP, Core I 7, RAM 16 GB, SSD 512 GB	1	1149,7
18	Projector EPSON	Projector EPSON-x49	1	672,6
19	Printer	Printer	1	161,9
<b>Total</b>				<b>24999,50</b>



**Courses** which organizing at i-Labs: There are 4 courses organized in i-Lab:

1. Automatic control theory
2. Applications of industrial Robots for Advanced Manufacturing
3. Electric drives
4. PLC for advanced mechatronics

**Total number of target groups** directly affected by the project i-labs:

Students (class)		Professors/Staff		Researchers		Others (please specify)	
Total	Female	Total	Female	Total	Female	Total	Female
160	16	10	1	5	1	20	8

[Opening ceremony of i-Lab](#) at Karshi engineering-economics institute was organized on 28<sup>th</sup> of April, 2022. Under the project, 22 different types of laboratory equipment and stuff have been purchased from “LUCAS NULLE” company of Germany for new Innovative [Mechatronics and Robotics Laboratory of KEEI](#).



### 3.6. P12\_Tashkent State Technical University

#### Workplan for the establishment at Tashkent State Technical University

No	Activities of WP4	Tasks	Duration	Responsible person
1	Establishment of iLabs	Selecting the list of equipment	03.01.2020-31.12.2020	S.Nematova
		Developing proposal for a list of necessary laboratory equipment	04.01.2021-30.06.2021	S.Turabdjanov
		<u>Selecting the offers and tendering procedure</u>	04.01.2021-30.06.2021	Sh. Azimov
		Make an agreement, transferring money and Customs clearance procedure of equipment purchased	04.01.2021-30.06.2021	B.Turimbetov
		Installing the equipment	04.01.2021-30.06.2021	M. Abdullaev, B. Yusupov
		Developing iLab materials and handbooks	30.06.2021-31.08.2023	S. Turabdjanov, M. Abdullaev, N. Alimova

#### Equipment list for i-Lab at TSTU

I-LABS was established at Tashkent State Technical University and was equipped with specialized equipment using the best practices of EU based on following table. Budget for the equipment was equal 22 181,50 euros (CONTRACT between TSTU and Lucas-Nülle GmbH for the purchase and delivery of i-Lab equipment, No. AB0010540).

#	Title of the equipment	Parts of Equipment	Quantity required	Total Costs
1	Handling Robot Mover4 HD, 4 Axis, 500 g	-	1	6761,17
2	IMS Mounting plate for training robot	-	1	305,21
3	Interactive Lab Assistant: CRT10 Setting up training robots	-	1	562,83
4	Workpiece, top section, white	-	1	75,53
5	Workpiece, top section, black	-	1	75,53
6	Workpiece, bottom section, black	-	1	74,49





7	UniTrain Interface with virtual instruments (basic VI)	-	1	74,49
8	UniTrain Experimenter	-	2	4947,5
9	UniTrain measurement accessories, shunts and connection cables	-	2	622,83
10	Course - Electric Machines 5: Stepper motors	-	2	382,81
11	Course - Electric Machines 5: Stepper motors	-	1	1917,13
12	Course - Electric Machines 6: Linear motors	-	1	4025,66
13	Course - Electric Machines 7: BLDC/servo motors	-	1	2163,37
14	UniTrain component kit, DC motor	-	1	27,42
15	UniTrain-I Breadboard system with cable set (140 pcs)	-	1	165,53
			<b>Total</b>	<b>22181,5</b>

**Courses** which organizing at i-Labs: There are 8 courses organized in i-Lab:

1. Automatic control systems
2. Electromechanical systems
3. Electrical Engineering and Electronics
4. Mechatronic system drives
5. Robotics
6. Design of mechatronic modules
7. Design of robot control systems
8. Modeling mechatronic modules and robots

**Total number of target groups** directly affected by the project i-labs:

Students (class)		Professors/Staff		Researchers		Others (please specify)	
Total	Female	Total	Female	Total	Female	Total	Female
134	4	14	2	7	1	0	0

Opening ceremony of [i-Lab at Tashkent State Technical University](#) was organized at 16 -20 May of 2022 at second meeting of the executors of this project.



#### 4. Establishment of Training Centre

**The Training Centre** to provide further need based education and to support the training of students and retraining of teachers and engineering specialists was established at AndMI, Uzbekistan.

**The main aim** of the establishing the Training Centre for students, teachers of special subjects and engineers to use the new laboratory equipment and Mechatronics Society for promoting research, development, and engineering science in the field of Mechatronics at AndMI.

The Training Centre was established to support professor-teacher, independent researcher, researcher, employees of production enterprises and students and for sustainable development of the project. The center is 32 square meters in size and has all amenities. The opening ceremony was held during the final meeting of the project, 4<sup>th</sup> of October, 2023.

**The list of necessary equipment** for training center are given follows:

#	Title of the equipment	Parts of Equipment	Quantity required
1	Server	- Server (Gen10)	1
2	Projector	- HDTV Projector	1
3	Laptop	- Laptop for Training	1
4	Desktop	- 12 generation	1
5	Tablet	- Tablet for training	1
6	All in one: printer, scanner, copy	- All in one: printer, scanner, copy	1
<b>Total</b>			<b>6</b>

Currently, the Centre provides both online and offline services for the students, teachers, researchers, and engineers.

Courses for offline:

- 1. Fundamentals of mechatronics (14 students enrolled).**
- 2. 3d design and printing (22 students enrolled).**

There is the Telegram channel for the participants of offline courses: [https://t.me/incubation\\_AndMI](https://t.me/incubation_AndMI) (Total number of followers: 253 around the Uzbekistan)



Online courses are being implemented through the educational platform organized within the project. It is [www.e-mechauz.uz](http://www.e-mechauz.uz). All contents of the course are placed on the project server. To date, the following courses have been uploaded to the platform and are free for all.

### **1. Engineering graphics.**

Link: [MUHANDISLIK VA KOMPYUTER GRAFIKASI \(II Qism\) – Onlayn ta'lim platformasi \(e-mechauz.uz\)](http://www.e-mechauz.uz)

### **2. Introduction to Mechatronics**

Link: [Mexatronika va robototexnika asoslari \(Arduino\) – Onlayn ta'lim platformasi \(e-mechauz.uz\)](http://www.e-mechauz.uz)

### **3. Introduction to CAD CAM CAE**

Links: [CAD CAM CAE asoslari – Onlayn ta'lim platformasi \(e-mechauz.uz\)](http://www.e-mechauz.uz)

### **4. Modeling the Mechatronic system**

Link: [Texnologik jarayonlarni modellashtirish va optimallashtirish asoslari – Onlayn ta'lim platformasi \(e-mechauz.uz\)](http://www.e-mechauz.uz)

### **5. Fundamentals of Mechatronics**

Link: [Mexatronika asoslari – Onlayn ta'lim platformasi \(e-mechauz.uz\)](http://www.e-mechauz.uz)

### **6. Control Theory**

Link: [Avtomatik boshqarish nazariyasi – Onlayn ta'lim platformasi \(e-mechauz.uz\)](http://www.e-mechauz.uz)

### **7. NI ELVIS III**

Link: [NI ELVIS III qurilmasi – Onlayn ta'lim platformasi \(e-mechauz.uz\)](http://www.e-mechauz.uz)



## 5. Mechatronic society of Uzbekistan

**Establishment of Mechatronics Society of Uzbekistan** is one the main objectives of the project for disseminate the results of MechaUz project. During the lifetime of the project, it was discussed several times, at the end name of the society had kept.

**The main aim of Society** is to promote research, students and engineers, to develop the engineering science in the field of Mechatronics. Mechatronics Society are another noble elements of this project (relying on Industry 4.0 & Education 4.0). Even though, the benefits of international societies and communities promoting the quality of education, research and development are enormous, involvement of Uzbek HEIs in international scientific communities has been very inert and rare. Establishment of Mechatronics Society of Uzbekistan will be exemplary and help to promote science and education in Mechatronics via continuous education, training and professional development, research, conferences, publications and other forms of outreach.

Mechatronics Society in Uzbekistan was established using [the best practices of EU](#), especially following sources:

1. Example of a website of a Mechatronics Society (or Mechatronics Web Portal) in France: <http://www.mecatronique.fr/>
2. Example of cluster in Belgium: <https://www.clustercollaboration.eu/cluster-organisations/mechanical-engineering-and-mechatronics-cluster-west>
3. Example of Industry Web Portal: <https://www.orgalim.eu/>
4. <https://unswmtrnsoc.org/>
5. <https://ismetek.org/>

**The Structure of the Mechatronics Society in Uzbekistan** consists of following positions:

- **Coordinator.** The main task of the coordinator is organizing the various parts of an activity to enable collaboration and efficient communication related to Mechatronics Society in Uzbekistan.
- **Experts.** The experts promote and support the Society based on their extensive knowledge or ability in research, experience, or occupation and in a particular area of activities.
- **Members.** Member roles are the privileges and leadership responsibilities given to a select few individuals within community.



Administration	Members	Organizations
<ul style="list-style-type: none"><li>• External Experts - MechaUz project partners from EU.</li><li>• Internal Experts - MechaUz project partners from Uzbekistan.</li><li>• Coordinator - National coordinator of MechaUz project</li></ul>	<ul style="list-style-type: none"><li>• Members from MechaUz partners.</li><li>• Members from non-partners of MechaUz.</li></ul>	<ul style="list-style-type: none"><li>• HEIs of MechaUz project.</li><li>• HEIs in Uzbekistan.</li><li>• Industries.</li></ul>

Regulations for administration and membership of the Mechatronics Society in Uzbekistan was developed.