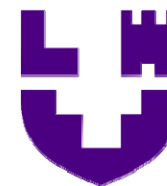


Main results



smartfactory
labs

Lutsk NTU



LUTSK
NATIONAL
TECHNICAL
UNIVERSITY

HEIn4.0



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Mykola Melnychuk

Benefits for target groups: students

The key elements of Smart Factory Lab are a real simulation of production process with real stations which include PLCs, actuators, conveyor, sorting process, sensors, smart and preventive maintenance because only work with real equipment can guarantee that learners could easily transfer knowledge from theory into practice and University in this case will play a role of a bridge between industrial needs and real skills of a learners.

- modern machinery manufacturing **technology design and automatization** (sectors - aviation, vehicles, power, agricultural);
- **programming and operation** of the CEROS (Robot programming, PLC programming, troubleshooting, production planning and production control
- **modern technologies for additive manufacturing** (3D scanning, 3D printing)
- **measurement of the** parts with complex geometry coupled with 3D protocol due to ISO 9001, ultrasonic control of parts' coupled with estimation of deviation from the design, check of surface geometry



Benefits for target groups: industry

- consultancy services,
- platform for meetings and discussions
- possibility to upgrade personal at short-term courses

Benefits for target groups: academia

- skills upgrade, colloquiums;
- collaboration with industry: consultancy services to industry; delivery of short term courses relevant to Industry 4.0;
- playground for conferences, round tables with various stakeholders



New_courses

Courses are developed on the basis of Smart Factor Lab, as a result implementation project.

Elective courses

- **Additive technologies and materials;**

for 2022/2023, it was elected by 30 students of various engineering specialties

- **Industry 4.0 (including programming PLCs; digital twins by CEROS, etc.)**

for 2022/2023, it was elected by 30 students of various engineering specialties

Mandatory courses

- **Management of Industry 4.0**
- **Digital Transformation of Production**



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	Name of the course	Educational program	Number of applicants in the academic year 2022-2023	Number of applicants in the academic year 2023-2024
Lutsk National Technical University	Management of industry 4.0 (master's degree)	"Industrial engineering and management" "Management" "Materials science"	40	70
	Industry 4.0 (master's degree)	"Industrial engineering and management" "Food technology" "Materials science"	30	36
	Additive technologies and materials (Bachelor's degree)	"Industrial engineering and management" "Food technology" "Materials science" "Manufacturing engineering"	60	42
	Digital transformation of production (bachelor's degree)	"Industrial engineering and management"	16	27

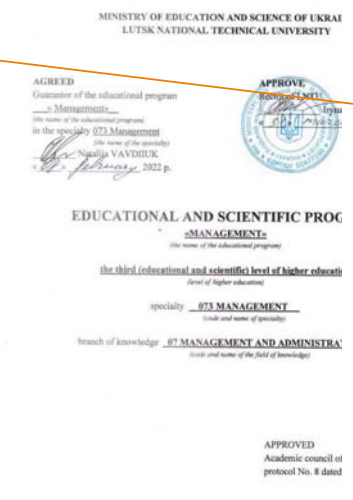


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Curriculum update

The results of the project were implemented in the educational programs of three levels of higher education, namely as mandatory courses:

- course "Management of Industry 4.0" in the educational program **Management** (Master) and **Materials Science** (Master)
- course "Digital Transformation" in the educational program **Management** (PhD)
- courses "Additive Technologies and Materials" and "Digital Transformation of Production" in the educational program **Industrial Engineering and Management**



9 - Academic mobility	
National credit mobility	It is carried out under the credit transfer system with domestic higher education institutions on the basis of bilateral agreements due to the transfer and re-orientation of credits for applicants from other universities.
International credit mobility	Opportunities for cooperation with European universities for the organization of mutual exchange of applicants, teachers and administrative staff under international academic mobility projects. Participants of Erasmus+ credit mobility must return to Ukraine, and the courses they studied are indicated in the appendix to the diploma. According to EU Erasmus+ programs on the basis of bilateral agreements between UNTU and institutions of partner countries: Marie Curie-Skłodowska University in Lublin (UMCS) in Lublin, Republic of Poland, Politechnic Institute of Bragança (IPB) in Bragança, Portugal, Lublin Polytechnic, Lublin, Republic of Poland, Vytautas the Great University, Kaunas, Lithuania, etc.
Education of foreign education seekers	On the general conditions of education of foreign citizens

LIST OF EC OF THE ESP			
Educational component code	The name of the educational components of the ESP (EC, final certification)	Number of ECTS credits	Final control form
1	2	3	4
Components of the educational component of the ESP			
1. Mandatory component			
1.1. Disciplines of general training			
FC1	Methods and models, information systems in management	5	exam
FC2	English for academic purposes	6	test
FC3	Methodology and organization of scientific research	6	test
1.2. Disciplines of professional training			
FC4	Management of scientific and innovative projects	5	exam
FC5	Pedagogy and psychology of the higher school	5	test
FC6	Strategies for the development of the organization	5	exam
FC6	Industry 4.0 management	5	exam
1.3. Free choice component			
2.1. General disciplines of free choice			
GD.EC.01	Discipline 1	5	test
2.2. Professional disciplines of free choice			
PD.EC.01	Discipline 1	5	test
PD.EC.02	Discipline 2	5	test
3. Practical training			
FC6	1. Pedagogical practice	6	subject opinion
The total amount of mandatory component			
		48	
The total amount of selective component			
		15	
The total volume of the educational component of the ESP			
		60	

компонент	(ЕК, курсова атестація)	кредити в ЕКТС	висновки з експертів	контракт
1.1. Інформаційні технології в управлінні				
GD.01	Управління проектами в Індустрії 4.0	5	Затверд.	1
GD.02	Управління проектами в Індустрії 4.0	5	Затверд.	1
GD.03	Управління проектами в Індустрії 4.0	5	Затверд.	1
1.2. Інформаційні технології в освіті				
OK.04	Математика та логіка	5	Екзамен	2
OK.05	Системний аналіз та методи моделювання	5	Екзамен	1
OK.06	Фізико-математичні методи	5	Екзамен	1
OK.07	Експертні методи	5	Екзамен	1
2. Інформаційні технології				
2.1. Інформаційні технології в освіті				
HE.01	Дисципліна 1	5	Затверд.	2
HE.02	Дисципліна 2	5	Затверд.	2
2.2. Професійні інформаційні технології				
HE.03	Дисципліна 1	5	Затверд.	2
HE.04	Дисципліна 2	5	Затверд.	2
HE.05	Дисципліна 3	5	Затверд.	2
3. Інформаційні технології				
OK.08	Управління проектами	12	Затверд.	3
4. Інформаційні технології				
OK.09	Кваліфікаційна робота/проект	18	Затверд.	3
Загальний обсяг обов'язкових компонентів		90	ЕКТС	
Загальний обсяг вибраних компонентів		0	ЕКТС	
Загальний обсяг освітньо-професійної програми		90	ЕКТС	

Форми атестації здобувачів вищої освіти
 Атестація здобувачів вищої освіти здійснюється у вигляді публічного захисту кваліфікаційної роботи.
 Кваліфікаційна робота передбачає розв'язання складної задачі матеріальності з використанням експериментальних методів матеріально-технічних досліджень, математичного моделювання комп'ютерного моделювання.
 Кваліфікаційна робота магістра не повинна містити академічного плагіату, фабрикації, фальсифікації.
 Кваліфікаційна робота має бути опублікована вільним розумінням на офіційному сайті закладу вищої освіти або структурного підрозділу або в репозиторії закладу вищої освіти.
 Описові дані кваліфікаційної роботи, що містить інформацію з обмеженим доступом, здійснювати у відповідності до норм чинного законодавства.



Training materials

We published some tutorials for studying Industry 4.0



Trainings in Smart Factory Lab LNTU

During the project implementation period, we held **7 trainings** at **Smart Factory Lab** for representatives of

industrial staff – 16 regional companies – 48 participants

academic staff – 4 university of Ukraine – 88 participants

public administration – 4 state institution – 60 participants



Trainings in Smart Factory Lab LNTU

On **September 16-18, 2023**, a two-day training on **"Tools for applying Lean leadership in the context of Industry 4.0"** was held at Lutsk National Technical University

The training program consisted of theoretical and practical parts.

The number of participants in the training was **17 people**, from 9 industrial companies in the region.



Trainings in Smart Factory Lab LNTU

«Tools for creating digital twins and programming PLCs for Industry 4.0»

October 04 - 08 2022, Lutsk National Technical University, Lutsk, Ukraine

The training program consisted of theoretical and practical parts .
The number of participants in the training was **30 people**, including **10 representatives** of 5 industrial companies in the region, and **20 teachers** from 4 universities of Ukraine.



Trainings in Smart Factory Lab LNTU

«Tools for creating digital twins and programming PLCs for Industry 4.0»

October 04 - 08 2022, Lutsk National Technical University, Lutsk, Ukraine

During the training, there was a discussion with company representatives about the current state of production and the needs for the use of digital twins, programming PLCs, and cooperation in the field of Industry 4.0 implementation.



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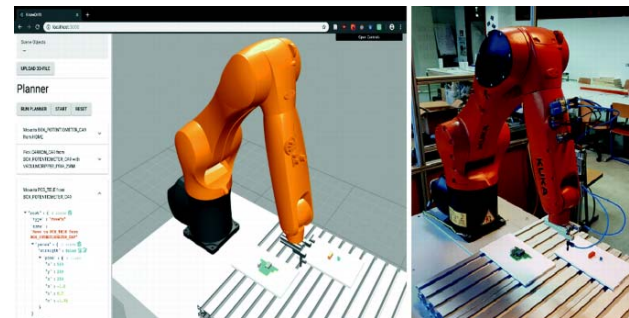
Key speakers:

FESTO - Ievgen Ryzhenko, Mykola Yakymenko

LNTU - Yurii Feshchuk. Natalia Vavdiuk, Mykola Melnychuk

Key topics of study:

- review of current solutions for creating digital twins for Industry 4.0;
- simulation of technological processes in CIROS Studio in real-time mode;
- methods of digital twins of manufacturing process creating with CIROS Studio;
- Programming of Siemens PLCs SIMATIC S7-1200/S7-1500
- Lean leadership for Industry 4.0



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Training for teachers LNTU 24-25.06.2021



The training was attended by
20 teachers from three faculties



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Round table with representatives of enterprises 23.06.2021



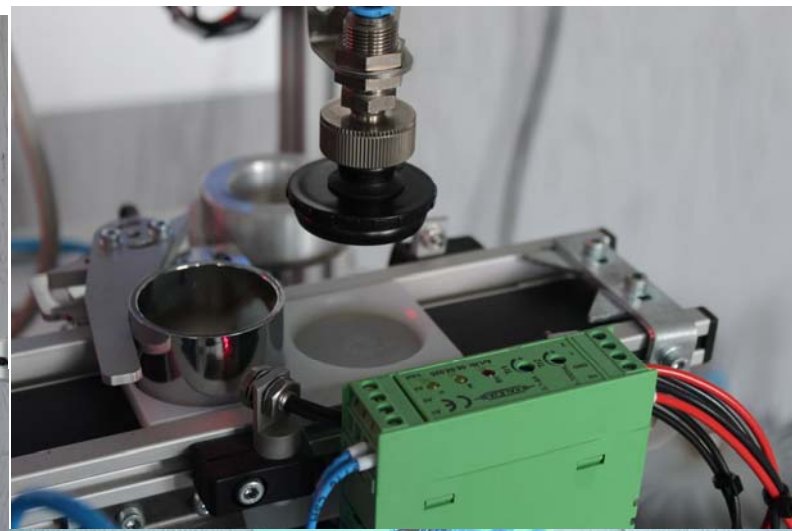
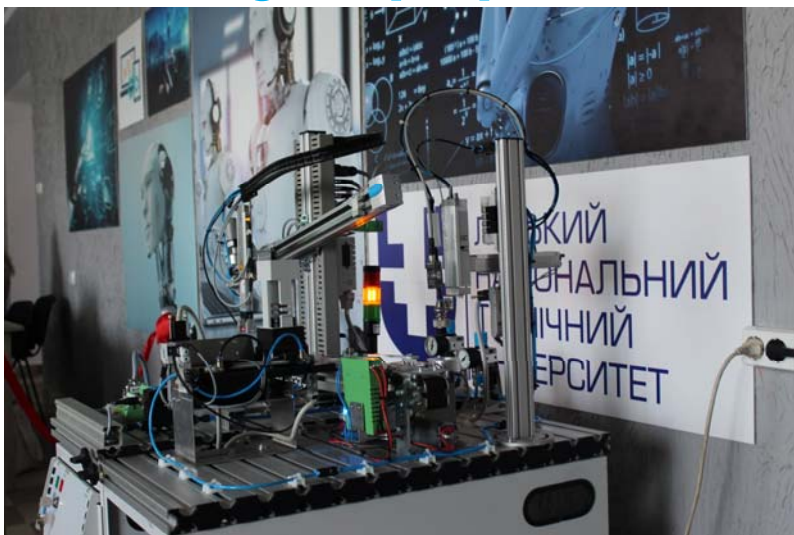
The event was attended by 12 representatives of 8 companies in the region:

- "Modern Expo";
- "SKF Ukraine";
- "Kromberg and Schubert";
- "Bogdan Motors";
- Tetraphan
- Terichem
- "Source"; - "Tigres groups



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SF Laboratory equipment

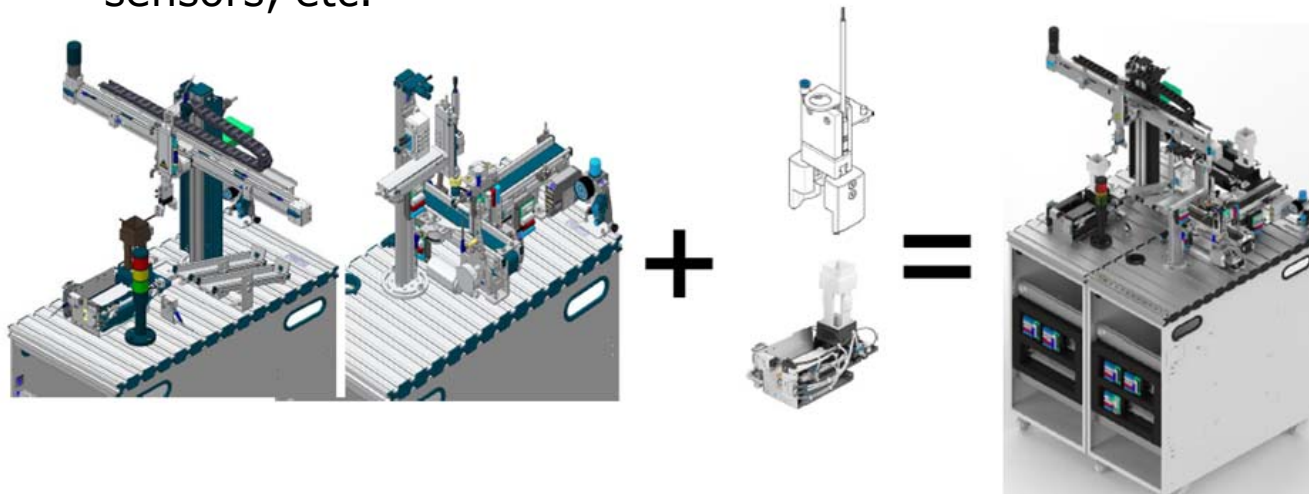


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SF Laboratory equipment

I. Set of two Modular Production stations – PLCs

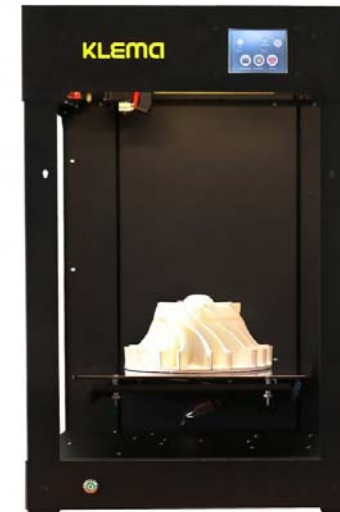
- 1 x Handling Station with electrical drive conveyor; actuators; SysLink-Terminals for connection
- 1 x special Joining Station; sorting process; sensors, etc.



SF Laboratory equipment

III. Additive production

3D Scanner to use in combination with 3D Printer



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Laboratory equipment

IV. Ultrasonic flaw detector to analyze quality

Ultrasonic flaw detector to analyze quality and faults in different kinds of materials during the simulation of real production.



- Void / Pores
- Inclusions Cracks (subsurface or surface)
- Weld Bond Defects (incomplete melting, porosity, groove shape)
- Corrosion / Oxidation
- Machining or Grinding Damage
- Forming / Rolling Mill Flaws
- Composite / Honeycomb Delamination
- Wire Rope / Cable Flaws
- Pipe / Tubing Flaws



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Spin off



Mobility Agreement



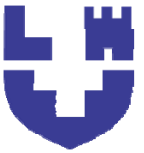
This Student Exchange Agreement has been signed in two (2) original copies by duly authorized representatives of the Parties on the day and year written below.

For KU Leuven, Prof. Luc Sels Rector Luc Sels (Signature) Date:	Digitaal ondertekend door Luc Sels (Signature) Datum: 2022.08.22 15:53:29 +02'00'	For Lutsk National Technical University Prof. Iryna Vakhovych Rector  Date:
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LNTU signed a mobility agreement with **KUL**.
 With **KTH** prepared and submitted two joint project proposals to the Erasmus + Program in the context of the implementation of Industry 4.0/5.0 in 2023

Call: ERASMUS-EDU-2023-PI-ALL-INNO (Partnerships for Innovation - Alliances)

Call: ERASMUS-EDU-2023-PEX-COVE (Partnership for Excellence - Centres of Vocational Excellence)



1 - General information

Topic	ERASMUS-EDU-2023-PI-ALL-INNO-EDU-ENT	Type of Action	ERASMUS-LS
Call	ERASMUS-EDU-2023-PI-ALL-INNO	Type of Model Grant Agreement	ERASMUS-AG-LS
Acronym	REVAMP		
Language	English		
Proposal title	Revolutionizing VET: Empowering Maintenance Education through Advanced Smart Learning Platforms		
Duration in months	36		

Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > * &

1 - General information

Topic	ERASMUS-EDU-2023-PEX-COVE	Type of Action	ERASMUS-LS
Call	ERASMUS-EDU-2023-PEX-COVE	Type of Model Grant Agreement	ERASMUS-AG-LS
Acronym	RISE		
Language	English		
Proposal title	RISE: Building Competence for Technological Advancements and Sustainable Transformation of European Community		
Duration in months	48		

Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > * &

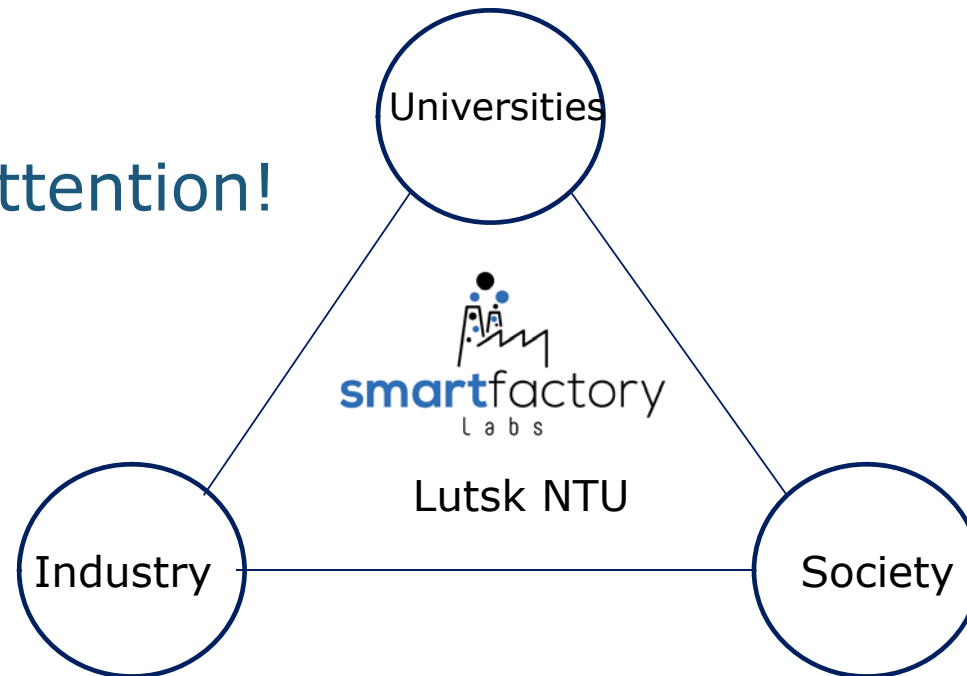


Virtual tour of Smart Factory Lab in LNTU



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Thank you for attention!



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