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Implementation Industry 4.0 Paradigm in Education. Ukrainian Experience

“Boosting the role of HEIs in the industrial transformation towards the Industry 4.0 paradigm in Georgia and Ukraine”

609939-EPP-1-2019-1-BE-EPPKA2-CBHE-JP-HEIn4

Implementation results in Ukrainian HEIs

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Ukrainian state university of science and technologies

Donetsk national technical university

Lutsk national technical university

Odesa national university I.I. Mechnikov

Daughter enterprise «Festo»

Batumi, 03 October 2023

IMPLEMENTATION of the project The concept of methodology and content of educational programs in accordance with the paradigm "Industry 4.0"



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Boosting the role of HEIs in the industrial transformation towards the Industry 4.0 paradigm
in Georgia and Ukraine
609939-EPP-1-2019-1-BE-EPPKA2-CBHE-JP

ОСНОВНІ АСПЕКТИ ІНДУСТРІЇ 4.0: ДОСВІД УКРАЇНСЬКИХ УНІВЕРСИТЕТІВ

Монографія

Проект фінансується за підтримки Європейської Комісії. Зміст публікації відображує точку зору авторів і Європейська Комісія не може бути відповідальною за будь-яке використання інформації, яка приведена в публікації.

Batumi, 03 October 2023

Recommendation for updating engineering curriculum

1

2



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RECOMMENDATION FOR UPDATING ENGINEERING CURRICULUM

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Creation of educational laboratories "Virtual Enterprise"

Industrial training laboratory Industry 4.0 (USUST)

The goal

- to offer a realistic environment for testing the basic engineering principles of an Industry 4.0 environment
- create an educational platform for Industry 4.0 concepts
- popularize the concepts of Industry 4.0 among a wide audience
- cooperate with innovators in the field of Industry 4.0

Equipment

The main equipment

CNC laser cutting machine 6040 80 Wt EFR F-2

CNC milling machine Sokol 4060

3D scanner EinScan-Pro HD

3D scanner Anet

3D printer Flasty TG

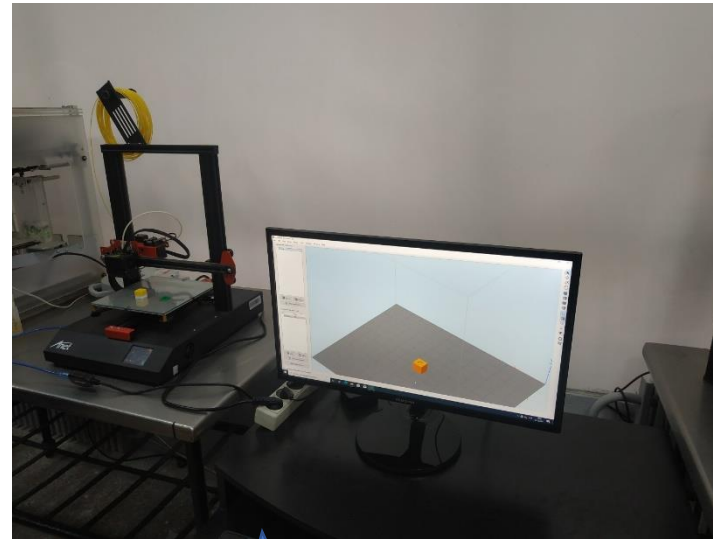
Addition equipment: 4 stationary computers (UPI3 system unit, Samsung monitor, Logitech keyboard, Logitech mouse); 2 Lenovo IdeaPad 5 14ITL05 laptops; uninterruptible power source APC back-UPS 900W/1600VA; network router Mikrotik RB2011UiAS-2HnD-IN; multimedia projector Acer X1527i; wall bracket for projector CHARMOUNT CT-PRB-8M; cables

Creation of educational laboratories "Virtual Enterprise"

Industrial training laboratory Industry 4.0 (USUST)



CNC laser cutting
machine 6040 80 Wt
EFR F-2



3D printer Anet



3D printer Flasty TG

Batumi, 03 October 2023

Creation of educational laboratories "Virtual Enterprise"

Mini-factory educational laboratory Industry 4.0 (DonNTU)

The goal

- Students and industrial personnel can solve a wide range of tasks:
- laboratory modeling and simulation of the main technological processes, calculation of structural characteristics and geometric dimensions of technological equipment;
- equipment cost estimation using big data as one of the main components of Industry 4.0;
- creation of an online e-learning platform for Industry 4.0 to spread knowledge and principles of Industry 4.0;
- training, exchange of experience, and improvement of the educational process for university students;
- cooperation between Ukrainian/foreign universities and enterprises implementing Industry 4.0;
- technologies to create cross-industry and international synergies

Equipment

Monoblock Lenovo Ideacentre AiO - 11;
Poyтер Mikro Tik Hap ac - 1;
Interactive panel 55" prestigio series L - 1
Projector Acer - 1
Software – 5

Lenovo Think Book S13 laptop - 5
Multifunctional device Canon I-Sensys Mf443DW - 2
Magnetic board on 5 surfaces and marker board – 1
Interactive universal mounting module Acer - 1
Microsoft Office 2021 - 11

Creation of educational laboratories "Virtual Enterprise"

Mini-factory educational laboratory Industry 4.0 (DonNTU)



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Creation of educational laboratories "Virtual Enterprise"

Smart-factory laboratory (LNTU)

The goal

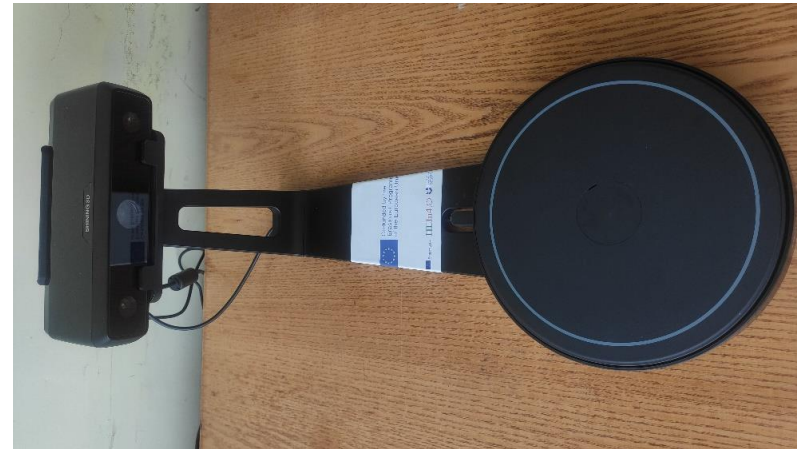
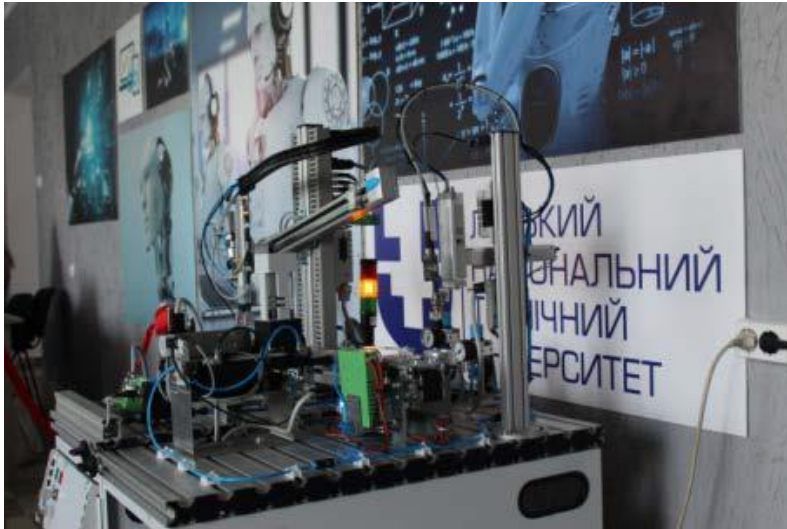
- to offer a realistic environment for testing the basic engineering principles of an Industry 4.0 environment
- to create an educational platform for Industry 4.0 concepts
- to popularize the concepts of Industry 4.0 among a wide audience
- to cooperate with innovators in the field of Industry 4.0

Equipment

- I. A set of two modular production stations - PLC:
 - 1 x processing station with a conveyor with an electric drive; executive mechanisms; SysLink – Terminals for connection
 - 1 special connection station; sorting process; sensors, etc.;
- II. CIROS Education licenses for simulation of real production processes;
 - Robot Programming, PLC Programming, Problem Solving, Production Planning and Production Control;
- III. Additive manufacturing
 - 3D scanner for use in connection with a 3D printer
- IV. Ultrasonic flaw detector for quality analysis
 - Ultrasonic flaw detector for analyzing quality and defects in various types of materials during simulation of real production.

Creation of educational laboratories "Virtual Enterprise"

Smart-factory laboratory (LNTU)



Batumi, 03 October 2023

Creation of educational laboratories "Virtual Enterprise" Virtual Factory Learning Lab Industry 4.0 (ONU)

The goal

- set organizational goals in Industry 4 0 by overcoming the structural and organizational complexity of business management in Industry 4 0
- to offer a virtual reality environment for testing the basic principles of managing Industry 4 0 business models

Equipment

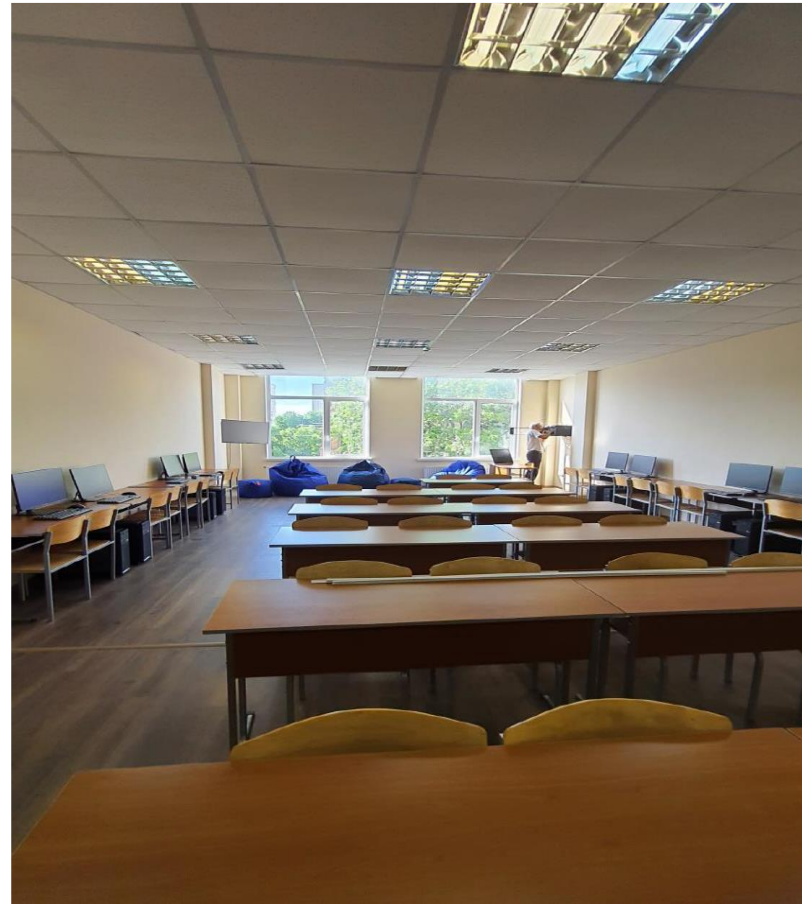
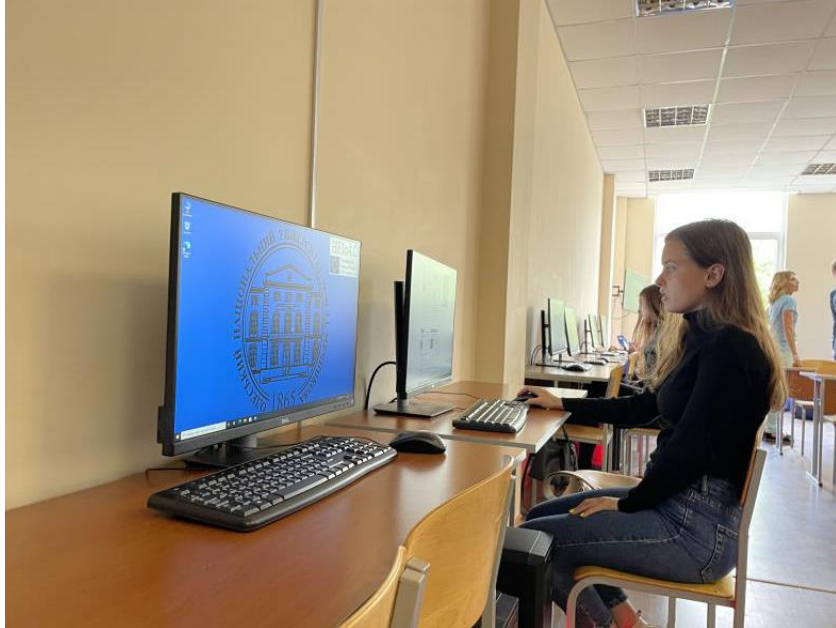
The main equipment

Dell U4320Q monitor with 10 m HDMI cable;
Lumi 150 motorized screen";Multimedia projector XGIMI HALO 3D 4K with cable;
Dell PowerEdge T40v14 64G server;
Specialized software for 3D visualization;
Business Studio 5 Enterprise + Business Studio Portal 5 software license; Portal Enterprise + Business Studio 5.

Additional equipment: 12 Desktop Artline WorkStation W35 v02; TR Link Archer A5 network router; Switch Zyxel GS1100-24; Cabinet 4U UA MGSWL435B ; 12 Dell P2421 Black monitors; 12 Sets of Logitech Desktop MK120.

Creation of educational laboratories "Virtual Enterprise"

Virtual Factory Learning Lab Industry 4.0 (ONU)



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Introduction of new academic disciplines for bachelors and masters

HEI	The name of the discipline	Educational program	The number of students in 2021-2022	The number of students in 2022-2023
Odesa National University named after I.I. Mechnikov	Business management in Industry 4.0 (bachelor)	073 Management, 051 Economy	36	39
Odesa National University named after I.I. Mechnikov	Business and management models in Industry 4.0 (master)	073 Management	12	9
Donetsk national technical university	"Industry 4.0: business management" (master)	16 Chemical and bioengineering	11	12

Introduction of new academic disciplines for bachelors and masters

HEI	The name of the discipline	Educational program	The number of students in 2021-2022	The number of students in 2022-2023
Lutsk National Technical University	Industry 4.0 management (master)	"Industrial Engineering and Management" "Management" "Materials Science"	30	90
Lutsk National Technical University	Industry 4.0 (master)	"Industrial Engineering and Management" "Food technologies" "Materials Science" "Industrial engineering"	40	70

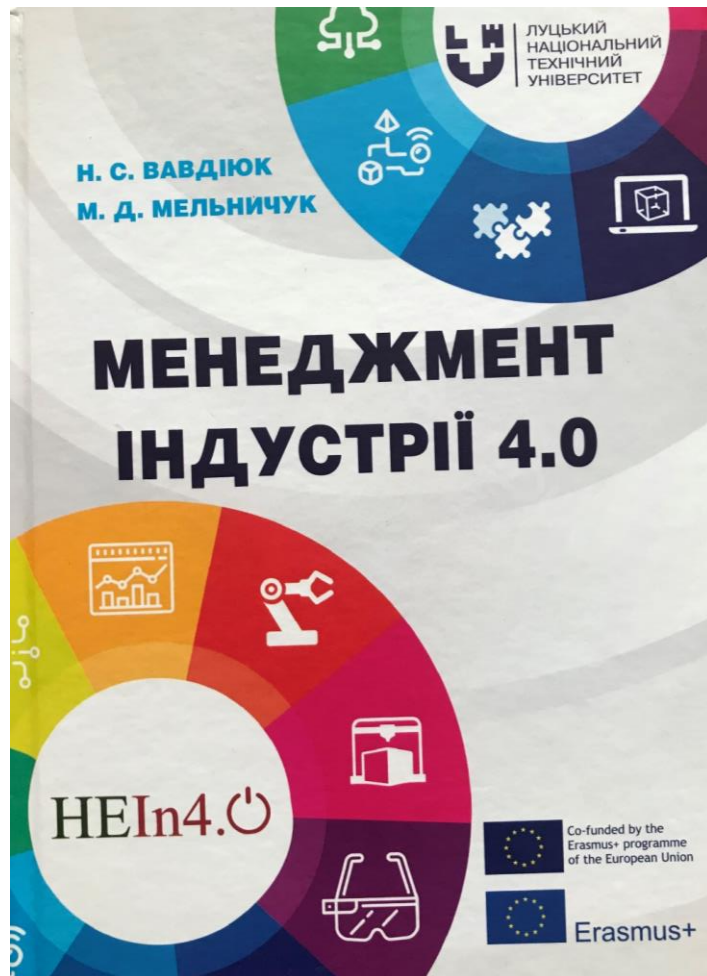
Introduction of new academic disciplines for bachelors and masters

HEI	The name of the discipline	Educational program	The number of students in 2021-2022	The number of students in 2022-2023
Lutsk National Technical University	Additive technologies and materials (master)	"Industrial Engineering and Management" "Food technologies" "Materials Science" "Industrial engineering"	30	100
Ukrainian state university of science and technologies	Industry 4.0 Integrated technologies in mechanical engineering (master)	133 – Branch machine-building EP Machine-building technology	8	22
Ukrainian state university of science and technologies	Industry 4.0 in Metallurgy (master)	136 – Metallurgy EP – Electrometallurgy of steel and ferroalloys EP – Special metallurgy	-	28

Summarizing the best European practices



Summarizing the best European practices



Batumi, 03 October 2023

ВПРОВАДЖЕННЯ проекту

Підвищення кваліфікації промислового персоналу

HEI	Total number of trainings	Total number of representatives of industrial partners	Main industrial partners	Notes
Odesa National University named after I.I. Mechnikov	1	17	Institution "Regional Development Agency of Odesa Region"	<p>The representative of the industrial project partner Mr. Bart Toen, Project Manager of the company "TEO", which is twice nominated for the prestigious Learning Technologies Award 2022 in London Volvo Cars Belgium, was involved</p> <p>The program was implemented as a Certificate program of ONU named after I.I. Mechnikova, Order 557-18 dated 04/03/2023. https://onu.edu.ua/uk/sertyfikatni-prohramy</p>
Lutsk National Technical University	3	82	Modern Expo, SKF Ukraine, Kromberg and Schubert, Bogdan Motors, "Motor" repair of aircraft, Tetraphan, Terichem, Source, Tigres groups, Volynholding	The project's industrial partner Festo was involved

ВПРОВАДЖЕННЯ проекту

Підвищення кваліфікації промислового персоналу

HEI	Total number of trainings	Total number of representatives of industrial partners	Main industrial partners	Notes
Donetsk national technical university	6	44	PJSC "Pokrovsk' Mine"; LLC "Concentration Factory "Sviato-Varvarynska"; PJSC "Avdiivka Coke Plant"; Ukrainian Scientific and Industrial Association UKRKOKS, Dnipro	
Ukrainian state university of science and technologies	2	19	Southern Machine-Building Plant, Ukrgrafit LLC, Zaporizhzhya Abrasive Plant, Dniprostal LLC, Dnipro Regional Vocational and Technical Education Center of the State Employment Service	

Improving the qualifications of teachers and administrative staff

HEI	Total number of trainings	The number of teachers who have undergone advanced training	The number of representatives of the administrative staff who have undergone advanced training	Notes
Odesa National University named after I.I. Mechnikov	4	57	2	The project's industrial partner Festo was involved It was conducted in synergy with the Jean Monnet EXTECH project
Lutsk National Technical University	4	46	7	The project's industrial partner Festo was involved
Donetsk National Technical University	3	15	2	The project's industrial partner Festo was involved
Ukrainian state university of science and technologies	3	24	3	The project's industrial partner Festo was involved

Impact and sustainability of project results

1. An improved system of training students of higher education in the context of the Industry 4.0 paradigm.
2. Industry 4.0 educational laboratories were created in 4 universities of Ukraine.
3. On the basis of mastering the best European practices, the qualifications and awareness of employees regarding modern approaches to higher education in the context of the 4th industrial revolution have been improved, which will certainly contribute to the improvement of the quality of higher education.
4. Enhanced interaction with industrial partners, which creates prerequisites for more active processes of transformation of productions taking into account modern technologies.
5. The experience is shared among other higher education institutions in Ukraine.



Thank you for attention!!