**Erasmus+ KA2
Capacity Building in Higher Education**

«Development of practically-oriented student-centred education in Cyber-Physical Systems modelling» «CybPhys»

Official number: 609557-EPP-1-2019-1-LV-EPPKA2-CBHE-JP

WP 2 «Development and modernizing of curricula»

Leader: Kharkiv National Automobile and Highway University

**Presented by:
Professor Andrii Hnatov**

Meeting 04-05.07.2022

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WP2 Tasks:

2.1. Development curricula and study programs for education. Teaching materials for the bachelor- and master-students study programs and courses. (14.08.2021) Completed

2.2. Teaching staff training on curricula topics. Students training on curricula topics. (14.11.2021.) In-progress (Extended due to the war in Ukraine.)

2.3. Teachers training on professional English languages skill. (14.11.2020.) Completed

2.4. Workshops for curricula and study programs development: WS2 – WS9. (14.11.2022) In-progress

2.5. Curricula accreditation in the universities and Accreditation offices of PCs. (30.06.2021.) In-progress (Extended due to the war in Ukraine. Postponed to 2023 by the decision of the Ministry of Education of Ukraine)

2.6. Testing and validation of the developed education programs, courses and lab practices. (14.06.2022) In-progress (Organization of student testing after the spring semester)

2.7. Tuning of curricula and study programs in PCs universities. (14.11.2022) In-progress

2.8. Measuring of a feedback of stakeholders. (14.08.2022) In-progress

2.9. Double Degree Master program development and accreditation. (14.08.2022) In-progress (RTU and KhNAHU start preparation for The student admission)

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Acceptance of new study programs and courses

CPNU: 5 new and 2 modernized courses

New: master degree courses in the new master program "Industrial Automation". The program will be accredited by the Education and Science of Ukraine.

➤ Model-oriented control in Digital Manufacturing

➤ Programming of Automation Systems

➤ Design and Simulation of Power electronics components

➤ Modelling and Measurement of physical processes in Robotics.

➤ Simulation of Manufacturing Environment

Updated courses in the existing Bachelor program "Computer systems of automation"

➤ Introduction to electronic systems

➤ Development of electromechanical robotic systems.

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Acceptance of new study programs and courses
CPNU: 5 new and 2 modernized courses

University	Course/Lab title	Updated or totally new	Level (Bachelor, Master)	ECTS credit points	The teaching/training methodologies developed/adopted e.g. e-learning/ training modalities, practical placements in enterprises, etc.	The link to the university' webpage	Date of accreditation	The status / document of accreditation
CPNU	Model-oriented control in Digital Manufacturing	New	Master	5	training methodologies developed ,	https://stu.cn.ua/wp-content/uploads/2021/04/new-courses20-1.pdf	April 27,/2020	Accreditation of the specialty "Computer engineering", master level. Certificate of accreditation series ND № 2685401 from June 27, 2017. The certificate is valid until July 1, 2024
CPNU	Programming of Automation Systems	New	Master	5	teaching	-"-	-"-	-"-
CPNU	Design and Simulation of Power electronics components	New	Master	5	training methodologies developed	-"-	-"-	-"-
CPNU	Modelling and Measurement of physical processes in Robotics	New	Master	5	teaching	-"-	-"-	-"-
CPNU	Simulation of Manufacturing Environment	New	Master	5	training methodologies developed	-"-	-"-	-"-
CPNU	Introduction to electronic systems	Updated	Bachelor	6	adopted	-"-	Marth 25,/2019	Accreditation of the specialty "Electronics", bachelor level. Certificate of accreditation series ND № 2687200 from July 31, 2017. The certificate is valid until July 1, 2024
CPNU	Development of electromechanical robotic systems	Updated	Bachelor	4	adopted	-"-	-"-	-"-

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Acceptance of new study programs and courses

KhNAHU: 2 new and 4 modernized courses

To develop 2 new training courses for master's students program "Electric Vehicles and Energy-Saving Technologies". The program will be accredited by the Education and Science of Ukraine.

➢ Energy-saving technologies in transport;

➢ The structure of hybrid and electric vehicles;

4 training courses will be upgraded and renewed for Master's students in "Electric Vehicles and Energy-Saving Technologies":

➢ Electric systems of environmentally friendly vehicles;

➢ Methods of planning scientific research on vehicles;

➢ Mathematical modelling and methods of optimization;

➢ Intelligent information technologies and systems in transport.

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Acceptance of new study programs and courses

KhNAHU: 2 new and 4 modernized courses

University	Course/Lab title	Updated or totally new	Level (Bachelor, Master)	ECTS credit points	The teaching/training methodologies developed/adopted	The link to the university' webpage	Date of accreditation	The status / document of accreditation
KhNAHU	Energy-saving technologies in transport	New	Master	8,5	Lecture, practicals, lab practicals	http://dl.khadi.kharkov.ua/course/view.php?id=1331	autumn 2022	Completed, autumn 2022
KhNAHU	The structure of hybrid and electric vehicles	New	Master	4	Lecture, lab practicals	https://dl.khadi.kharkov.ua/course/view.php?id=1630	autumn 2022	Completed, autumn 2022
KhNAHU	Electric systems of environmentally friendly vehicles	Updated	Master	4	Lecture, lab practicals	http://dl.khadi.kharkov.ua/course/view.php?id=1356	autumn 2022	Completed, autumn 2022
KhNAHU	Methods of planning scientific research on vehicles	Updated	Master	5,5	Lecture, practicals, lab practicals	https://dl.khadi.kharkov.ua/course/view.php?id=1363	autumn 2022	Completed, autumn 2022
KhNAHU	Mathematical modelling and methods of optimization	Updated	Master	3	Lecture, lab practicals	https://dl.khadi.kharkov.ua/course/view.php?id=1733	autumn 2022	Completed, autumn 2022
KhNAHU	Intelligent information technologies and systems in transport	Updated	Master	8,5	Lecture, practicals, lab practicals	http://dl.khadi.kharkov.ua/course/view.php?id=1357	autumn 2022	Completed, autumn 2022

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Acceptance of new study programs and courses

KNU: 3 new and 4 modernized courses

New: master degree

➢ Smart manufacturing based on cyber-physical systems

➢ Machine Learning for Cyber Physical Systems and Industry

➢ Transportation Cyber-Physical Systems

Updated master degree: Training courses will be upgraded and renewed for Master's students in "Cyber-physical systems" and "Automobiles and Fleet".

➢ Project approach to the designing of cyber-physical systems

➢ Adaptive and Robust Systems

➢ Open-Pit Transport Cyber-Physical Systems

➢ Modern Information Technologies in Transport

Kharkiv National Automobile and Highway University

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Acceptance of new study programs and courses

KNU: 3 new and 4 modernized courses

University	Course/Lab title	Updated or totally new	Level (Bachelor, Master)	ECTS credit points	The teaching/training methodologies developed/adopted	The link to the university' webpage	Date of accreditation	The status / document of accreditation
KNU	Smart manufacturing based on cyber-physical systems	new	Master (mandatory)	8	Discipline teaching plan, syllabus, lectures, distant learning materials	https://classroom.google.com/c/MjU0NjIyMzc2NjU5?cjc=i4jbi5l	Autumn 2022	Approval protocols: - №8 from 09.02.21 – Department of Automatiom, Computer Scienses and Technologies - №7 from 22.02.21 – Faculty of international Technologies - №7 from 23.02.21 Academic Council of KNU. Order №109 from 24.02.21 on the implementation of the Stydy Programm and teaching plans
KNU	Machine Learning for Cyber Physical Systems and Industry	new	Master (mandatory)	6	Discipline teaching plan, syllabus, lectures, distant learning materials	https://classroom.google.com/c/NDAwNjE0Mzg4MTYw?cjc=s2lfpam	Autumn 2022	Approval protocols: - №8 from 09.02.21 – Department of Automatiom, Computer Scienses and Technologies - №7 from 22.02.21 – Faculty of international Technologies - №7 from 23.02.21 Academic Council of KNU. Order №109 from 24.02.21 on the implementation of the Stydy Programm and teaching plans
KNU	Transportation Cyber-Physical Systems	new	Master (variable)	8	Discipline teaching plan, syllabus, lectures, distant learning materials	https://classroom.google.com/c/NDI2MjU0MDAxMTkx?cjc=chhhhvg	Autumn 2022	Approved by ACST dep. #1 from 25.08.21
KNU	Open Pit Intelligent Transportation System	updated	Master (variable) Bachelor (variable) for specialty 275 – Transportation technologies (on road transport)	8	discipline curriculum, syllabus, lectures	https://classroom.google.com/c/NDI2MjM5ODI0MzI3?cjc=swvawpr	Autumn 2022	Approved by ACST dep. #1 from 25.08.21 Approved by KNU authorities prot #7 from 14.05.2020

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Acceptance of new study programs and courses

KNU: 3 new and 4 modernized courses

University	Course/Lab title	Updated or totally new	Level (Bachelor, Master 5-year course)	ECTS credit points	The teaching/training methodologies developed/adopted	The link to the university' webpage	Date of accreditation	The status / document of accreditation
KNU	Modern Information Technologies in Transport	updated	Master (variable) Bachelor (variable) for specialty 275 – Transportation technologies (on road transport)	8	discipline curriculum, syllabus, lectures	https://classroom.google.com/c/NDAyNzc1ODk0MzM1?cjc=2sbxy6v	Autumn 2022	Approved by ACST dep. #1 from 25.08.21 Approved by KNU authorities prot #7 from 14.05.2020
KNU	Adaptive and Robust Systems	updated	Master (mandatory)	8	Discipline teaching plan, syllabus, lectures, distant learning materials	https://classroom.google.com/u/1/c/MjI0NDQ4MjU3MTg3	Autumn 2022	Approval protocols: - №8 from 09.02.21 – Department of Automatiom, Computer Scienses and Technologies - №7 from 22.02.21 – Faculty of international Technologies - №7 from 23.02.21 Academic Council of KNU. Order №109 from 24.02.21 on the implementation of the Stydy Programm and teaching plans
KNU	Project Approach to the Designing of Cyber-Physical Systems	updated	Master (variable)	8	Discipline teaching plan, syllabus, lectures, distant learning materials	https://classroom.google.com/u/1/w/MjI0MTE5Mjg1MTg3/t/all	Autumn 2022	Approval protocols: - №8 from 09.02.21 – Department of Automatiom, Computer Scienses and Technologies - №7 from 22.02.21 – Faculty of international Technologies - №7 from 23.02.21 Academic Council of KNU. Order №109 from 24.02.21 on the implementation of the Stydy Programm and teaching plans

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DOUBLE DEGREE PROGRAM

**Double Diploma Master Program
between
Riga Technical University
and
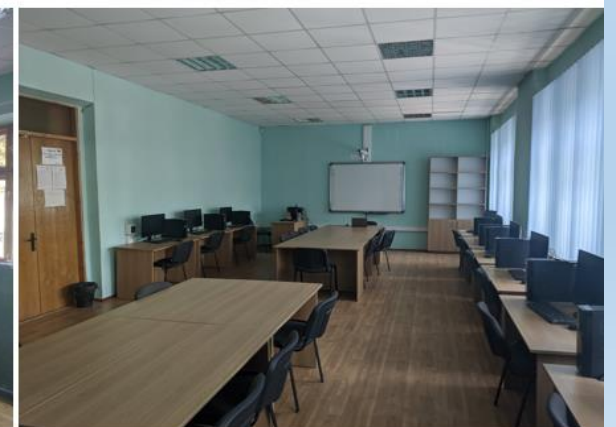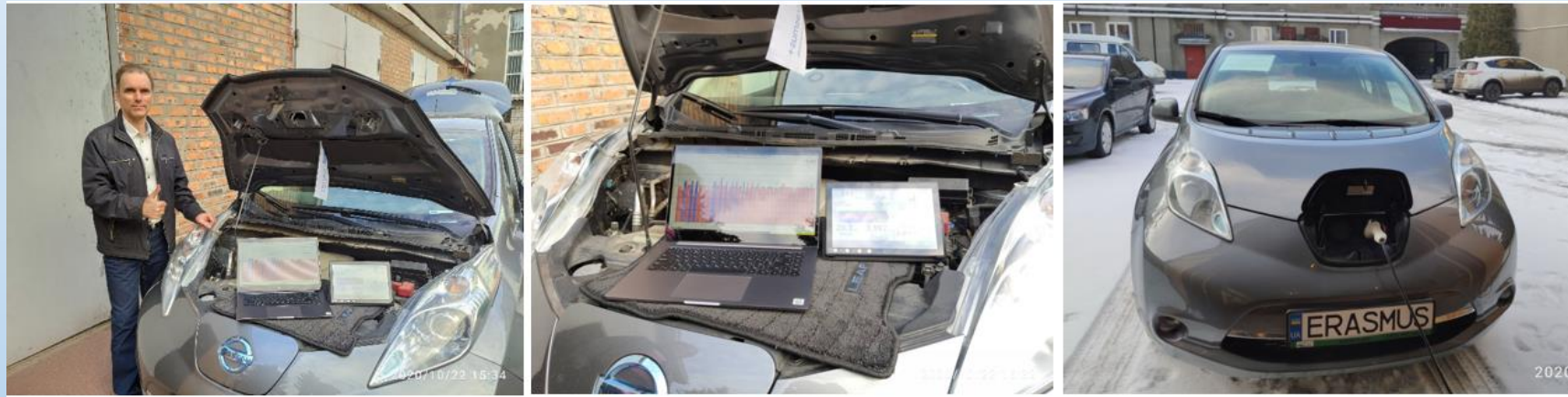Kharkiv National Automobile and Highway University**

An agreement was signed between Riga Technical University and Kharkiv National Automobile and Highway University on the introduction of a double degree diploma in the educational process of the master's degree program **"Electric Vehicles and Energy-Saving Technologies"** (within 141 specialties "Electric Power, Electrical Engineering and Electromechanics").

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Laboratory of Energy-saving technologies in transport

The lab "Laboratory of Energy-saving technologies in transport" was created.

Arrangements for testing of new developed and modernized courses

It is proposed to develop additional courses on behalf of «CybPhys»

The KhNAHU team is ready to:

Develop 1 course for PhD Level, Specialty 141 "Electric Power, Electrical Engineering and Electromechanics":

➢ Progressive technologies in road transport – **4 ECTS credit.**

Modernize 4 courses for bachelor level, Specialty 141 "Electric Power, Electrical Engineering and Electromechanics":

➢ Electric drive theory - **11 ECTS credit;**

➢ Electronics and integrated circuits – **15 ECTS credit;**

➢ Electrical machines – **5 ECTS credit;**

➢ Electrical engineering, electronics and microprocessor technology – **9.5 ECTS credit.**

It is proposed to develop additional courses on behalf of «CybPhys»

The KNU team is ready to:

Develop 2 course for PhD Level Specialty 151 - Automation and computer-integrated technologies:

➤ Cloud computing in cyber-physical systems;
➤ Intelligent control systems for cyber-physical systems.

Develop 1 discipline for master's level, Specialty 274 - Road transport

➤ Transport systems of big cities.

It is proposed to develop additional courses on behalf of «CybPhys»

The CPNU team is ready to:

Develop for master's level, Specialty "Computer engineering and Industrial Automation"
1 new course:
➢ Modern methods and technologies of data processing - **5 credits;**
1 Modernised course:
➢ Design of embedded computer systems - **5 credits.**

Develop for bachelor level, Specialty "Computer systems of artificial intelligence"
3 new courses:
➢ Neural networks and evolutionary computations - **3 credits;**
➢ Data mining - **4 credits;**
➢ Theory of statistical solutions - **4 credits.**
1 Modernised course:
➢ Systems modeling - **5 credits.**

Development of E-books

1. Bringing innovations to the market (leader – RTU).
2. Mathematical Modelling of Mechatronic Systems (leader –KU Leuven).
3. Model-oriented control in Intelligent Manufacturing Systems (leader – CPNU). _RTU Publishing House is processing electronic text books electronic issue
4. Modern Mathematical Physics: Fundamentals and Application (leader - BSU).
5. High-Performance Scientific Computing and Data Analysis (leader – BSU).
6. Cyber-Physical Systems modelling and simulation (leader – UCY). _RTU Publishing House is processing electronic text books electronic issue
7. Cyber-Physical Systems for Clean Transportation (leader – KhNAHU). _RTU Publishing House is processing electronic text books electronic issue
8. Control methods for critical infrastructures and IoT interdependencies analysis (leader – RTU).
9. Computer modelling of physical processes (leader – MSPU).

Contacts

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