Chernihiv Polytechnic National University

Erasmus+ project 609557-EPP-1-2019-1-LV-EPPKA2-CBHE-JP

"Development of practically-oriented student-centred education in the field of modelling of Cyber-Physical Systems", Acronim "CybPhys"

NEO Ukraine Monitoring Mission
October 29, 2000, Chernihiv

Ukrainian part of CybPhys project consortium

Universities
1. **Chernihiv Polytechnic National University – UA coordinator**
2. **Kharkiv National Automobile and Highway University**
3. **Kryvyi Rih National University**

Associative members:
1. **V.M. Glushkov Institute of Cybernetics of National Academy of Science of Ukraine**
2. **Joint-stock company "Kharkiv enterprise of bus stations"**

Cooperation activities

CPNU as a project coordinator from Ukraine has implemented a number of activities aimed at updating the project activities in Ukraine, namely:

- translated the Grant Agreement into Ukrainian;

- adapted the basic Partnership Agreement to Ukrainian legislation

- registered the project in the Cabinet of Ministers of Ukraine with the approval of the equipment procurement plan

- integrated data of project participants from Ukraine related to the developed courses and programs

- interaction with the National Office Erasmus +UA

- interaction with the RTU coordinator.

Chernihiv Polytechnic National University (CPNU)

The University is a member of Magna Chartia Uneversitatum since 2013.

The structure of the University includes 7 Educational-Science Institutes, 33 Departments, Postgraduate and Doctoral Studies Department, Science-Research Department, Business-Innovation Center, and 2 Colleges.

10150 students study at the University. The training is provided on 32 directions and 29 specialties.

The number of regular scientific-pedagogical teachers is 311 including 48 Professors, 190 PhD, 104 young scientists.

There are 5 specialized Academic Councils for thesis defending on 8 specialties, two of them is for Doctor of science degree.

EU project experience

Tempus projects

    1. IEMAST - Establishing Modern Master Level Studies in Industrial Ecology (2011 - 2015).

    2. IHSITOP - Innovation hybrid strategy of IT-outsourcing partnership with enterprises (2012 – 2016).

    3. CABRIOLET - Model-Oriented Approach and Intelligent Knowledge-Based System for Evolvable Academia-Industry Cooperation in Electronic and Computer Engineering (2013 – 2017).

    4. BUSEEG-RU-UA - Acquiring professional and entrepreneurial skills by education of entrepreneurial spirit and consulting beginners-entrepreneurs (2013 – 2017).

NATO project

    5 . CyRADARS» - Cyber Rapid Analysis for Defense Awareness of Real-time Situation (2017-2020).

EU grant under the Eastern Partnership for Territorial Co-operation

    6. Transboundary system of hydro meteorological and ecological monitoring of the Dnipro River (2018-2020).

CybPhys support structure

Institute of Electronic and Information Technologies

Department	Specialty
Information and Computer Systems	Computer Engineering (base department)
Electrical Systems and Networks	Electrical engineering
Electronics, Automation, Robotics and Mechatronics	Electronics
Biomedical Radio-Electronic Devises and System	Radio electronic devices
Information measuring technologies	Metrology and information-measuring technique
Information Technologies and Software Engineering	Software Engineering
Cyber Security and Mathematical Modeling	Cyber Security

Education levels: bachelor (4 years – 800 students), master (1.5/2 years – 200 students), PhD (4 years – 21 students)

Partner companies:

Project team

1. **Kazymyr Volodymyr,** Dr., prof.,professor of information and computer systems department — Manager

2. **Shkarlet Sergey,** Dr., prof., former rector, professor of information and computer systems department — Researcher

3. **Zaitsev Sergey,** Dr., as. prof., professor of information and computer systems department — Researcher

4. **Ivanets Sergey**, PhD, as. prof., director of electronic and information technology institute — Teacher

5. **Prystupa Anatoliy ,** PhD, as. prof., head of Information Measuring Technologies, Metrology and Physics department — Teacher

6. **Veligorsky Oleksandr,** PhD, as. prof., head of Biomedical Radio-Electronic Devices and Systems department — Teacher

7. **Voitenko Volodymyr, PhD, as. prof.,** department of Electronics, Automatics, Robotronics and Mechatronics — Teacher

8. **Yakimenko Iryna,** PhD student , information and computer systems department, QA manager — Trainer

9. **Sysa Dmitryi ,** Director of the educational-scientific information and computer center, technical manager — Technical Staff

10. **Gaydaiy Natalia**, leading accountant, financial manager — Technical Staff
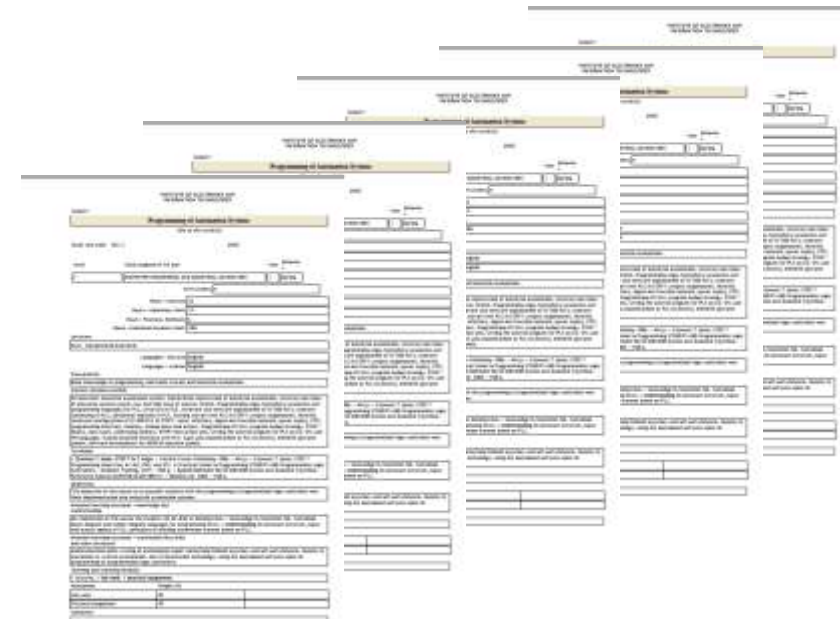
CPNU project outcomes

1. Accreditation of a new educational program at the master's level "Computer Engineering and Industrial Automation"
2. Development of 5 new master's courses:
   - Model-oriented management in digital production
   - Programming of automation systems
   - Modeling and measurement of physical processes in robotics
   - Design and modeling of power electronics components
   - Simulation modeling of the production environment
3. Upgrading of two bachelor's courses:
   - Introduction to electronic systems
   - Development of electromechanical robotic systems
4. Purchase of the equipment and creation of new CPS modelling laboratory
5. Developer of e-book "Model-oriented management in intelligent production systems".
6. Teachers and student mobility.
7. QA support.
8. Dissemination activities.
9. Sustainability providing.

New educational program
"Computer Engineering and Industrial Automation"

- Second (master's) level of higher education (FQ-EHEA - second cycle, EQF-LLL - 7 level)
- Specialty - 123 "Computer Engineering"
- areas of knowledge - 12 "Information technologies"
- Qualification: master's degree of Computer Engineering
- 90 ECTS
- term of study - 1 year 4 months
- Accredited by Academic Council of CPNU on April 27, 2020 according to Certificate of accreditation of the specialty 123 "Computer Engineering" master degree, Series ND № 2685401 from June 27, 2017. The certificate is valid until July 1, 2024
- https://stu.cn.ua/media/files/opp/opp-123-m-2-1.pdf

Curricular
"Computer Engineering and Industrial Automation"

Code	Title of course	ECTS
General disciplines		
GC 1	English (Professional Communication)	4
GC 2	Civil protection and labor protection in the industry	3
GC 3	Intellectual Property	3
GC 4	Technologies of Software systems design	6
GC 5	Design of computer systems and networks	5
GC 6	Design of Embedded Computer Systems	5
GC 7	**Programming of Automation Systems**	5
GC 8	**Modelling and Measurement of physical processes in Robotics**	5
Optional disciplines		
OC 1.1	**Simulation of Manufacturing Environment**	5
OC 1.2	Modern data processing methods and technologies	5
OC 2.1	**Model-oriented control in Digital Manufacturing**	5
OC 2.2	Multiplatform environments and virtualization	5
OC 3.1	Intellectual robots	5
OC 3.2	Modern cybersecurity methods and technologies	5
OC 4.1	**Design and Simulation of Power electronics components**	5
OC 4.2	Software for specialized computer systems	5
OC 5.1	Distributed computing and cloud technologies	4
OC 5.2	Real-time operating systems	4
Practical training		
PT 1	Pre-diploma practice	12
Certification		
MT 1	Master's thesis	18
TOTAL		**90**

- Recruited students 2020   - 13
- New courses   - 5
- New teachers   - 4
- Syllabuses   - 5
  https://stu.cn.ua/media/files/opp/opp-123-m-2-1.pdf

E-books activities

1. Developing of e-book 3 jointly with RTU

Model-oriented control in Intelligent Manufacturing Systems

Titles	Responsible	Terms
3.1 Industrial 4.0 concept		
3.2 The principles of Model-oriented control	RTU	06/2020
3.2 Models of control algorithms implementation	CPNU	12/2020
3.3 Prediction Models and its optimization	CPNU	12/2020
3.4 Recovery models and methods for their construction	CPNU	03/2021
3.6 Models of planning and Quality Assurance	CPNU	03/2021
3.7 Hardware and software Tools of MOC	CPNU	03/2021
3.8 Examples of MOC application	CPNU	06/2021
	CPNU	06/2021

2. Participation in developing of e-books:

- e-book 2 **Mathematical Modelling of Mechatronic Systems** (leader – KU Leuven)
- e-book 6 **Cyber-Physical Systems modelling and simulation** (leader - UCY)
- e-book 9 **Computer modeling of physical processes** (leader - MSPU)

Purchase of equipment&software

Wolfram Research
кому: license ▾

文A английский ▾ › русский ▾ Перевести сообщение

Welcome to Premier Service, a program we've designed to help you get the most out of Wolfram SystemModeler.

Product: SystemModeler
Activation Key: 4499-9311-AGK5TJ

- an announcement at the site on Augest 31, 2020 (**https://cs.stu.cn.ua/site/publication?id=49**)
- Internal tender on September 17, 2020
- Purchase on September 21 – October 10, 2020

Purchased equipment	Planned EUR Total	Fact EUR Total
Equipment		
Hardware Complex for Education in new master program "Industrial Automation": - 10 pcs with i7 Intel X-Series or better, monitors, etc. - Notebooks 2 pcs	11000	11050
USB oscilloscopes with with measuring equipment - 12 pcs	3000	3000
Cloud servers : 2 pcs	9000	9100
Software (Mathematica, Wolfram System Modeler) - 5 licences	5000	4788,23
	28000	27938,23

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Project mobility

Event	Purpose	Type of participants	Number of partic.	Country of origin
Kick-off meeting in Minsk December 5-6, 2019	WS	Teachers, managers	1	Belarus
Workshop WS1, WP1: Preparation MC1: Management meeting in Minsk, March 11-12, 2020	MC and WS	Teachers, managers	1	Belarus
Zoom meeting 27.07.2020	MC and WS	Teachers, managers	1	On-line
Zoom meeting 3.08.2020	MC and WS, QA	Teachers, managers	2	On-line
Zoom meeting 7.09.2020	MC and WS	Teachers, managers	1	On-line
Zoom meeting 5.10.2020	MC and WS	Teachers, managers	1	On-line

Quality Assurience Support

1. The University has the certificate on the system of quality assurance according to ISO 9001.
2. Courses documents inspection :
   - curriculums (approved at the level of the vice-rector);
   - lecture notes (department level);
   - guidelines (department level);
   - modular and individual tasks, tests, exam tickets (department level);
   - packages of complex and rector's control works (rector level)
3. Internal audit (educational and methodical department level).
4. Mandatory Moodle support.
5. Mutual visits of teachers.
6. CybPhys project QA audit (according to QA plan).

7. Project planning is carried out in accordance with the Grant Agreement and under the guidance of the coordinator. Performance indicators are defined by the Quality Assurance Plan.

8. Communication with the coordinator, partners from Ukraine and foreign partners is carried out through face-to-face meetings, online meetings and seminars using video conferencing, e-mail correspondence, direct contacts of developers of e-books.

9. An important element of interaction is the use of the project website, which is developed and operates on the basis of RTU (https://cybphys.rtu.lv/) and SybPhys e-library on the basis of BSU (https://eduphys.bsu.by/mod/folder/view.php?id=2257).

Dissemination activities

Information about the project, its purpose, objectives, planned results, performers and partners is published on the university website: https://en.stu.cn.ua/staticpages/cybphys-en/

A new master's educational program "Computer Engineering and Industrial Automation" developed within the project is also published on the university website: https://stu.cn.ua/media/files/opp/opp-123-m-2-1.pdf

The website of the leading department of Information and Computer Systems published an advertisement of a new educational program and an offer to join it: https://cs.stu.cn.ua/site/publication?id=50

Also on the website of the department there is an announcement about the purchase of equipment and software for the CybPhys project: https://cs.stu.cn.ua/site/publication?id=49

All materials contain the project logo and the Erasmus + logo.
Three meetings of the department were held with informing about the progress of the project.

The university website has a link to the project website. https://cybphys.rtu.lv/

Dissemination activities

2020

Practical-oriented education in modeling and simulation for Cyber-Physical Systems

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10th International Conference "Advanced Computer Information Technologies"
ACIT'2020
May 13-15, 2020 , Deggendorf, Germany

Video with the paper stream for the conference is available at

https://video.th-deg.de/paella/ui/watch.html?id=fe2cedf7-fe67-40a3-86e8-4796e1069168

Dissemination activities

On-line conference

Chernihiv Polytechnic moves the Industry 4.0 with Erasmus+

Information Day of the project 609557-EPP-1-2019-1-LV-EPPKA2-CBHE-JP "Development of practically-oriented student-centred education in the field of modelling of Cyber-Physical Systems", acronym "CybPhys" will be held on October 16th 2020 at 11.30 a.m. online with discussion on new master level courses directed to the needs of Industry 4.0 in Chernihiv region and Ukraine.

https://us04web.zoom.us/j/71968550357?pwd=WEROZGFCNmJBTkZlTXREZ2xNcWI5dz09

Meeting ID: 719 6855 0357 Passcode: 0D9BbB

https://www.facebook.com/chepolytech/

Sustainability providing

Stakeholder participation extends to the following areas:

- **development of new master program (National Aerospace University "Kharkiv Aviation Institute", National Academy of Sciences of Ukraine, PET Technologies Ukraine Ltd.)**

- **development of courses (Chernihiv IT-cluster, JSC Koryukovska factory of technical papers, Association of Industrial Automation Enterprises of Ukraine, LLC Firm "Solti" – Kharkiv, Institute of Software Systems of the National Academy of Sciences of Ukraine, HVD LLC - Chernihiv)**

- **enrollment of students (Regional state administrations, State Research Institute for Testing and Certification of Arms and Military Equipment, PJSC "CHESARA" - Chernihiv)**

- **internships for students and teachers (Institute of Mathematical Machines and Systems Problems of the Ukraine National Academy of Science, enterprises of Ukroboronprom, PET Technologies Ukraine Ltd.).**

Total results

1. *Percentage of deliverables completed - 33%*
2. *Percentage of budget used - 33%*
3. *Number of participants for mobility activities (workshops, meeting) - 6 (4 online)*
4. *Curriculum:*
- *Accredited – 4 (new), 2 (updated)*
- *Number of teachers trained so far - 5*
- *Number of students enrolled so far - 13*
- *Involvement of industrial, economic, social partners - 12*
- **New curriculum showcased on websites -** https://stu.cn.ua/media/files/opp/opp-123-m-2-1.pdf
5. *Following documents visible on the project website*
- *Syllabus -* https://stu.cn.ua/media/files/pdf/New-courses20.pdf
- *Learning outcomes -* http://en.stu.cn.ua/staticpages/cybphys-en/
- *Teaching methodology -* http://en.stu.cn.ua/staticpages/cybphys-en/
- *Number of credits allocated - 35*
- *Manuals to be used by learners - 1 e-book (in progress)*
- *List of curricula where the updated subject is taught :*
    - *"Computer engineering and Industrial Automation" - master level*
    - *"Electronics of robotic systems and complexes" - bachelor level*

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