



Tempus

Development of Embedded System Courses with implementation  
of Innovative Virtual approaches for integration of Research,  
Education and Production in UA, GE, AM



TEMPUS-project 544091-TEMPUS-1-2013-1-BE-  
TEMPUS-JPCR

P04-ZNTU report on activities  
from 1.12.2013 till 1.12.2014



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# Overall achievements

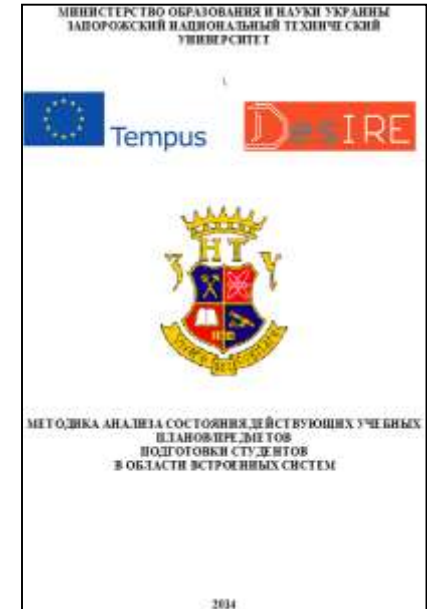




### Performed curricula analysis technique

#### Considered 8 specialties/49 disciplines related to Embedded Systems:

- Electrical machines and apparatus
- Electromechanical automation systems and electric drive
- Radio electronic devices and tools
- Micro-and nanoelectronic devices and equipment
- Computer systems and networks
- Specialized computer systems
- Software Systems
- Information technologies of design





- Performed analysis of the existing E-learning resources





- Developed questionnaires for the survey of employers and students by ZNTU



<http://serv-peter.no-ip.org:8000/questions/>



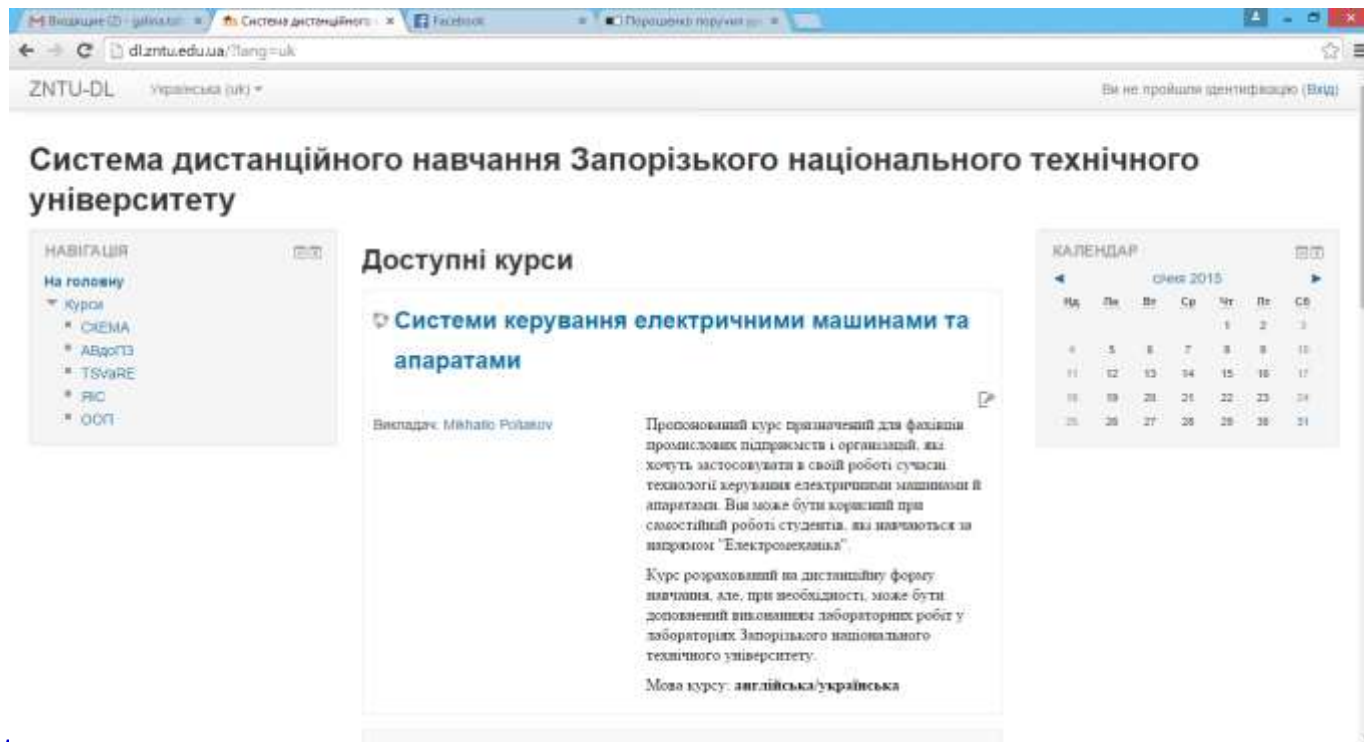
# Tempus

WP3 Implementing a (virtual)

learning environment in ESD eng.



- Established LMS platform



**Moodle – Learning Management System in ZNTU**

<http://dl.zntu.edu.ua/>



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# Development of programmes and courses



- Responsible of implementation of Project

## Modules

Galina Tabunshchyk - ZNTU Project Manager, Ph.D., associate professor of Software Tools Department;

Alexander Andriyenko - Assistant of rector for International Cooperation, Quality Manager, Ph.D, professor of Electrical Apparatus department;

Anatoliy Pritula - Ph.D, Professor of Software Tools Department;

Anzhelika Parkhomenko - Manager of UECG, Ph.D., associate professor of Software tools department;

Andriy Parkhomenko, Engineering Physics Faculty, Deputy Head of Teaching department, PhD, associate professor,

Anna Nelasa, Faculty of Radio Electronics and Telecommunications, Department of Information Protection, PhD, associate professor,

Tatiana Yur, Faculty of Computer Science and Technology, Software Tools Department, PhD, associate professor/





## Modules implemented in curricula in 2014/2015

	Discipline	Specialty	Responsible
1	MCAD structural design, Pro Engineer	Software Engineering	Assoc. Prof. Anzhelika Parkhomenko
2	Embedded Software Development	Software Engineering	Galyna Tabunshchyk
3	GUI development	Software Engineering	Sergiy Serduik
4	Remote Labs and Virtualizations	Software Engineering	Anzhelika Parkhomenko
5	Soft Skills for engineers	Software Engineering	Anna Nelasa
6	Quality Engineering	Informational Technology of Design	Galyna Tabunshchyk
7	ES Software Testing	Artificial Intelligence	Galyna Tabunshchyk



# Restructuring: university management and governance



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# New laboratory of embedded systems and remote engineering was established





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# Staff training



## •Criteria for teachers selection for the re-training

- 1) English proficiency of "conversational" level
- 2) Teaching related disciplines
- 3) Scientific interests in embedded systems field
- 4) Preliminary study of the materials submitted by partner countries.



- Summer course «New teaching approaches in Engineering» in UKF, Nitra, Slovak Republic (September, 2014)



<http://www.zntu.edu.ua/?q=node/2464>



- Organizing courses for the teachers and researchers in ZNTU

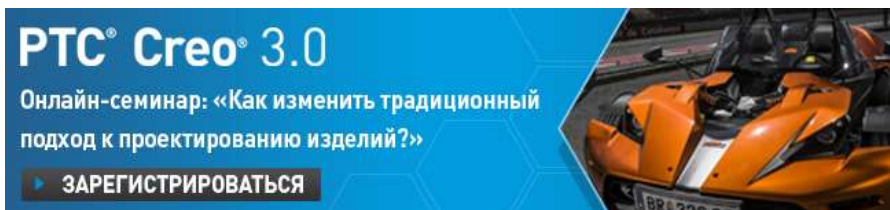


<http://zntu.edu.ua/seminar-metody-dystanciynogo-elektronnogo-navchannya-v-osviti>





- Participation in the webinars by PTC (October 23, 2014), by Altium Limited (December, 2014) and by the Boris Grinchenko Kyiv University (November, December, 2014)



(<http://zntu.edu.ua/do-uvagy-vykladachiv-zntu>)





## Staff mobility



## Kick-off meeting



**Representatives:**  
**Assoc. Prof. Galyna Tabunshchyk**  
**Assoc. Prof. Anzhelika Parkhomenko**



- Regional meeting (Kiev, May 2014)



**Representatives:**  
**Assoc. Prof. Galyna Tabunshchuk**  
**Assoc. Prof. Anzhelika Parkhomenko**

<http://www.zntu.edu.ua/?q=node/2392>,



- Summer course «New teaching approaches in Engineering» in UKF, Nitra, Slovak Republic (September, 2014)



**Representatives:**

**Assoc. Prof. Galyna Tabunshchuk**

**Assoc. Prof. Anzhelika Parkhomenko**

<http://www.zntu.edu.ua/?q=node/2464>



# Academic co-ordination and administrative management





- Expert Panel



**Galina Tabunshchyk** - ZNTU Project Manager, Ph.D., associate professor of Software tools department.

**Alexander Andriyenko** - Assistant of rector for International Cooperation, Quality Manager, Ph.D, professor of Electrical Apparatus department.

**Anatoly Pritula** – Ph.D, Professor of Software Tools Department

**Anzhelika Parkhomenko** - Manager of UECG, Ph.D., associate professor of Software tools department

**Larisa Duiko** - leading specialist of International relations department



## •Departments involved in the project

- Software Tools
- Information Technologies of Electronic Devices Design
- Electrical Apparatus
- Electrical Machines
- Computer Systems and Networks
- Electric drive and automation of industrial plants





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# Equipment





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WP3 Implementing a (virtual)

learning environment in ESD eng.

Software, purchased by the project March-May, 2014

PTC Creo 2.0  
(500 licenses)



ALTIUM Designer  
(20 licenses)



# Tempus

## Equipment for ESD Laboratory arrived 14.01.2015



Получатель: "ФСТ Комен Р.О."  
Тел: 544-443-80-94  
Тел: 2600171188230 и 1147 "Учредитель" МКО 301000  
ГРН 2600002542  
Секретарь: К.В.Р. № 275033 від 28.09.2004 р.  
Адрес: м. Київ, вул. Варшавська, буд. 3, кв. 11  
Почтовый адрес: м. Київ, вул. Варшавська, буд. 3, кв. 11  
Знакомый национальный технический университет  
адрес: 60000, Тернополь,  
вул. Заручинь,  
вул. Мухоморова, 44

Получатель: "ФСТ Комен Р.О."  
Датум: 14.01.2015 р.

Вид документа: Накладна на ввезення товарів  
№: 016-14012015-2  
Від: 14.01.2015

Найменування обладнання	Кількість	Ціна, грн.	Сума, грн.
Система на базі плати DELL T110 V QC E3-1230v2 з програмним забезпеченням Microsoft Windows Server 2012 R2 з такими параметрами: • 3.30Hz PERC 1000 MHP DVD+RW • CPU E5-1650 • RAM 2*16GB • Клавіатура • Монітор ПК Engineer моделі "Impression" з програмним забезпеченням Microsoft Windows Professional та такими параметрами: • Процесор Intel Core i3-4150 3.0GHz 3MB 60W LGA1150 • CPU DDR3 1600MHz 2x8GB • HDD 500GB SATA • DVD RW • Блок живлення 360W • Клавіатура • Монітор Монітор LED LCD Samsung S240300H Black D-Suh	1	30710.00	30710.00
	8	8660.25	70882.00
	8	2664.25	21314.00
<b>Всього</b>			<b>127550.25</b>

Всього на суму без ПДВ: 127550.25 грн.

Відомості про:

Оформлено:

ЗАТВЕРДЖУЮ  
ФСТ «Комен Р.О.»

ЗАТВЕРДЖУЮ  
Ректор Інформаційного  
національного технічного університету  
Батюк С.Б.  
2015 р.

М.П. Комен Р.О. 2015 р.

М.П. МКО

АКТ №

акт-свідчення обладнання та робіт по монтажу  
згідно проекту №: 544201-TEMPUS-1-2015-1-DE-TEMPUS-IPCH

м. Тернополь  
Комен у складі

Від Отримувача — Дубровін В.І.

Від Виконавця — Комен Р.О.

Мі, підписавши Свідоцтво Виконавця Національного Технічного університету  
Дубровін В.І., з одного боку, та підписавши Виконавця фінансової підтримки  
Комен Р.О., з іншого боку, свідчать про те, що Виконавцем було передано  
наступне обладнання та було проведено такі роботи з монтажу локальної мережі для  
лабораторії вбудованих систем та віддаленої виконавця на загальну суму 26912.75 грн.  
(двадцять шість тисяч дев'ятсот дванадцять гривень, сімсот дванадцять копійок).

№	Роботи	Од. виміру	Кількість	Ціна, грн.
1	Монтаж та налагодження роботи	шт.	1	2500

При виконанні робіт було використано наступне обладнання та витратні матеріали:

Найменування обладнання	Кількість	Ціна, грн.	Сума, грн.
Комп'ютерна HP ProCurve 1410-18G (16MBA)	1	3200	3200
Кабель витяг ланка FTP (е-AT) (вир. 3050) 0.50mm mda	1	2100	2100
Конектор RJ45 універсальний 100шт	1	205	205
Шнурок монтажний 100шт	1	200	200
Патч-корд ланка, UTP, RJ45, Cat. 5e, 3м, сірий	18	115	2070
Комплекти кріплення штекера/розетки RJ45, добола, стовпи	1	300	300
Розетка RJ45 cat 5 та UTP, інсталізація	18	100	1800

бланкування енням Shneider	Кількість	Ціна, грн.	Сума, грн.
енням Makel	18	89	1602
5 мм², 1м	100	14	1400
2 автомат	1	230	230
автомат	1	140	140
7-29 M-1p-25A	10	225	2250
7-29 M-3p-63A	1	195	195
	5	65.75	328.75
	16	39	624
стиковий з кришкою мм, 1м	7	125	875
стиковий з кришкою мм, 1м	18	155	2790
для установки в короб	8	130	1040
вільний	1	78	78
тр 85	1	15	15
ою розеток 1м	2	290	580
а	4	258	1032
	1	325	325
	6	27	162
<b>Всього матеріалів:</b>			<b>24412.75</b>
<b>Всього по акту:</b>			<b>26912.75</b>

режа для лабораторії вбудованих систем та віддаленої  
біт Виконавцем перевірена у присутності представника  
гравмі засоби" Дубровін В.І. та зав.лаб. каф. ПЗ  
необхідним вимогам. Виконані Виконавцем роботи  
и та прийняті повністю. Отримувач ніяких претензій до  
ня та строкам проведення робіт не має.

Від Отримувача

О. /  / Дубровін В.І. /  
 / Калініна М.В. /



# Dissemination



- Best Job Fair, ZNTU, April, 2014



<http://www.zntu.edu.ua/best-job-fair-2014>



- Dissemination meeting, Porto, February, 2014







- Dissemination meeting, ZNTU, March, 2014



## CERES



## DesIRE



<http://zntu.edu.ua/vzaiemodiya-proektiv-tempus-u-zntu>



- Dissemination meeting, ZNTU, April, 2014





- Dissemination meeting, December, 2014



<http://zntu.edu.ua/synergiya-proektiv-desire-ta-engitec>





## Signed agreements on cooperation ZNTU-Enterprises in the framework of the project



<http://www.zntu.edu.ua/zustrich-studentiv-z-robotodavcyami-predstavnikami-grupi-kompaniy-aktiv>

- Dissemination through web resources



<http://www.zntu.edu.ua/?q=node/2198>

<http://www.zntu.edu.ua/?q=node/2280>



- Dissemination through posters and flyers









- Publications of project results

1) XI International Conference on Remote Engineering and Virtual Instrumentation (REV2014), Porto, Portugal, February, 2014



2) XII International Conference “Modern Problems of Radio Engineering, Telecommunications and Computer Science” (TCSET’2014), Lviv, Ukraine, February- March, 2014





- Publications of project results

3) The 18th International Youth Forum «Radio electronics and youth in the XXIst century» (Kharkiv, Ukraine, April, 2014)

4) Annual scientific conference «Science Week ZNTU-2014», (Zaporizhzhya, Ukraine, April, 2014)

5) Xth International Conference «PERSPECTIVE TECHNOLOGIES AND METHODS IN MEMS DESIGN», (Lviv, Ukraine, June, 2014)





- Publications of project results

6) Scientific-practical conference  
«Modern Problems and  
Achievements of Radio Engineering,  
Telecommunications and  
Information Tecnology»,  
(Zaporizhzhya, Ukraine, September,  
2014)

7) International scientific-practical  
Conference «Internet-Education-  
Science-2014», (Vinnitsa, Ukraine,  
October, 2014)





# Sustainability





- University-Enterprise Contact Group

<b>Mykola Iefymenko</b>	Manager of research-and-production enterprise “Khartron-Yukom”
<b>Andrii Spakhy</b>	Manager of Automation Department of public joint-stock company “Zaporozhtransformator”
<b>Olexii Basov</b>	Manager of technical documentation division of public joint-stock company “Motor Sich”
<b>Mykola Artem’yev</b>	General director of “Sterling Group Ukraine” Ltd
<b>Olexandr Kuznetsov</b>	Manager of bureau of Internet technology and industrial design of automated production control system department of research-and-production trust “Iskra”
<b>Oleg Pozdnyakov</b>	Consulting director, "Brig-Retail" Ltd.
<b>Olena Zhytova</b>	Head of the Department of professional orientation of Zaporizhzhya region placement service



- Sustainability: MSc and Specialist Diploma works by ZNTU students

- Igor Borodai (supervisor G. Tabunshchyk) «Investigation and development of real-time multimedia tools for iOS»
- Olexandr Drin (supervisor G. Tabunshchyk) «Development of web-oriented context of on-line course»
- Olga Kahytyna (supervisor A. Parkhomenko) «Automated system for radiators structural optimization for cooling radioelectronic devices»
- Jaroslav Zalyubovskiy (supervisor A. Parkhomenko) «Information system for distance learning and support of staff knowledge»
- Olga Gladkova (supervisor A. Parkhomenko) «Methods and tools of embedded systems computer-aided design»



- Sustainability: Bachelor Diploma by ZNTU students, spring 2014
  - Oleksiy Smirnov (supervisor G. Tabunshchyk) «Development services for interaction of web-oriented systems»
  - Sergiy Kurson (supervisor G. Tabunshchyk) «Simulator of industrial robot»
  - Rodion Byelka (supervisor G. Tabunshchyk) «iOS GUI development for remote laboratory
  - Arthur Perepelytsya (supervisor A. Parkhomenko) «Software of mathematical models formation for the tasks of tolerances design»
  - Maxim Shilo (supervisor A. Parkhomenko) «Development of information environment for business processes optimize project»



# Quality control and monitoring



### • Students opinion analysis

**Participated in the survey 90 students of following directions of training:**

- Software Engineering
- Computer Science
- Electromechanics
- Electrical engineering and electrotechnology
- Computer Engineering
- Radio-electronic devices

**DesIRE** **Tempus**

Home About DesIRE Consortium Project Course material Dissemination Contact

Dear students!

Within the Tempus project 544091-TEMPUS-1-2013-1-BE-TEMPUS-IPCR Development of Embedded System Courses with implementation of Innovative Virtual approaches for Integration of Research, Education and Production in UA, GE, AM there are planned to involve new methods of teaching and new disciplines in your curricula.

You are kindly invited to answer our survey!

Surname :

First name :

1. Your University :

2. You study program :

3. Year of study :

4. Do you know what is embedded systems? :

5. Do you know what is distance learning? :

6. Do you know what is Learning management system Moodle:

7. Do you know what is virtual laboratory? :

8. Do you know what is remote laboratory? :

9. Do your teachers use innovative technologies during lessons ( (multimedia, virtual tools) :

10. Do your teachers use innovative technologies during lab-sessions (virtual, remote laboratories, LMS Moodle) :

11. Do your teachers use on-line testing for knowledge control :

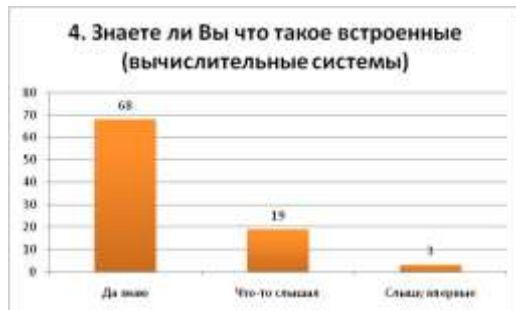
Please rate the importance of each following course for you (For evaluation use the following assessment scale, select matter, 1 - a minimum score, 5 - the maximum score)

12. Microcontrollers :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
13. Digital Electronics :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
14. Digital System Design :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
15. Embedded Communication :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
16. Sensors, Actuators and Interfacing :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
17. C for Embedded System :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
18. Embedded Software Development :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
19. Embedded Operating Systems :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
20. GUI development :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
21. Multicore Programming :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
22. Testing :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
23. ECAD- electronic design system ALTIUM DESIGNER :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
24. MCAD- structural design system PTC CREO :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
25. Digital Signal Processing :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
26. Remote Lab and Virtualization :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
27. Quality Engineering :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
28. New teaching approaches in Engineering :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
29. Soft Skills for engineers :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2
30. Management and Marketing for Engineers :	<input type="radio"/> 0	<input type="radio"/> 1	<input type="radio"/> 2

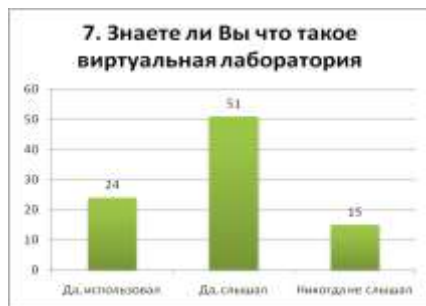
☐ 3 ☐ 4 ☐ 5



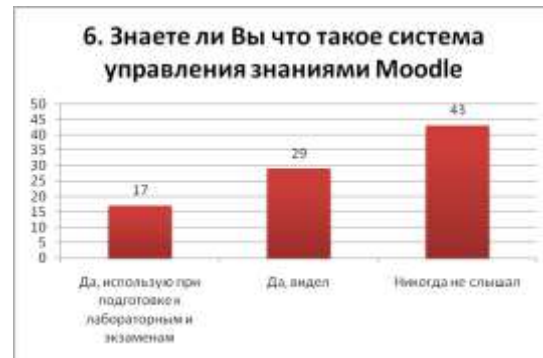
- Students opinion analysis



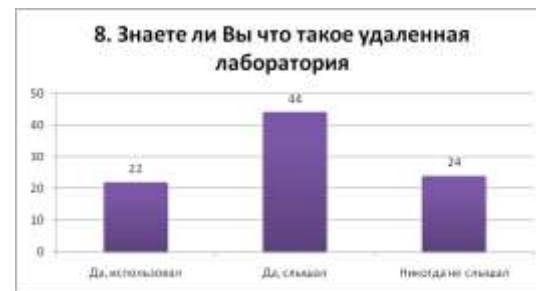
**What is embedded systems**



**What is a Virtual Laboratory**



**What is LMS Moodle**

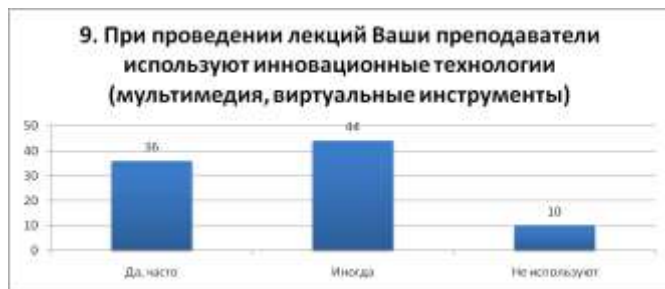


**What is a Remote laboratory**

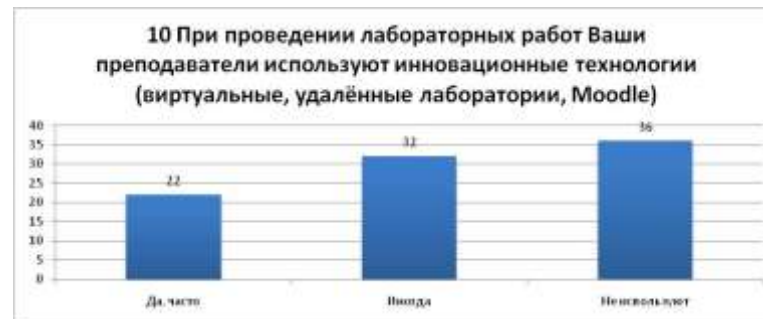




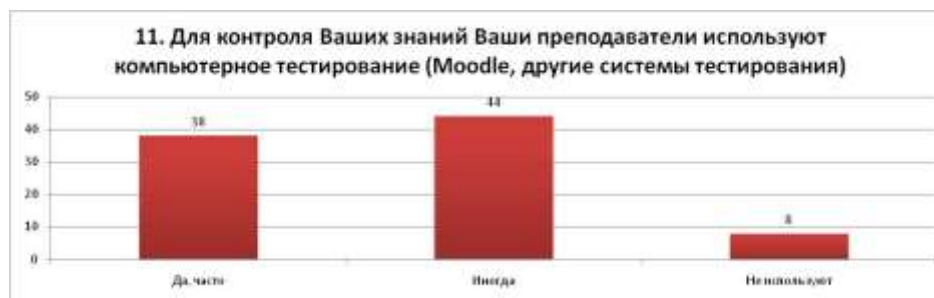
- Students opinion analysis



**The use of innovative technologies in the lectures**



**The use of innovative technologies in the labs**



**Using computer-based testing**



- Students opinion analysis

## The most important disciplines in the opinion of students

- GUI development
- New teaching approaches in Engineering
- Multicore Programming
- Soft Skills for engineers
- Digital Electronics
- Digital System Design



### •Labor Market Analysis





### Employers opinion analysis

#### Participated in the survey:

- 11 companies – employers:
- NPP Hartron-Yukom,
  - JSC ZTR,
  - KP NPK Iskra,
  - "Brig-Retail" Ltd,
  - Bmuse,
  - Cupid
  - LLC "Prohservys",
  - Energoavtomatizatsia,
  - LynxInnovation and others.

**DEAR EMPLOYERS!**

There is a list of competencies that, in our opinion, are important in the field of embedded systems design (competency ability to apply knowledge and understanding to professional activities, and the ability to successfully operate in the team of practical experience in solving the tasks of common study. Please rate the importance of each competency for your company:

1 - not important at all, 2 - not important, 3 - average, 4 - important, 5 - very important

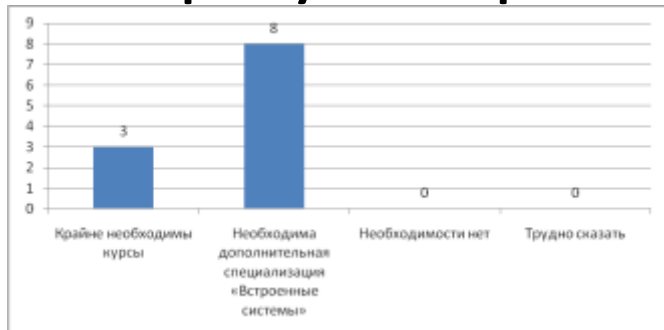
1. To use modern software tools for modeling and creating production systems, in various programs in high-level programming languages in field and no model of modern manufacturing systems	1	2	3	4	5
2. To use potentials of local networks and the Internet - technologies in systems design	1	2	3	4	5
3. To apply a standard way of describing (modeling) of industrial products in all ranges of their life cycle	1	2	3	4	5
4. To use the achievements of computer graphics and geometric modeling to computer-aided design	1	2	3	4	5
5. Modern means of design automation for engineering problems solving	1	2	3	4	5
6. To improve design automation systems with automated systems of technological preparation of production and engineering calculation automation systems	1	2	3	4	5
7. To design and test software components of ES	1	2	3	4	5
8. To design software systems and programs and ensure their interoperability, to ensure the testing of such and planning of resources, to build bases of process knowledge	1	2	3	4	5
9. To develop and transform mathematical models of phenomena, processes and systems for their effective software and hardware implementation	1	2	3	4	5
10. To provide the decision of complex systems performance due to the organization and implementation of design engineering algorithms, distributed multi-process systems and Grid and Cloud Technologies	1	2	3	4	5
11. To apply computer-aided design tools to solve actual problems of various technology (green, energy, nano- and microsystems, nanoelectronics, etc.)	1	2	3	4	5
12. To perform risk analysis, use of CASE-tools in the design of ES for the analysis of their requirements, quality development and control, optimization of the design	1	2	3	4	5
13. The use of standards and contemporary technological processes of ES design	1	2	3	4	5
14. Development and use of modern service-oriented information technology (distributed and multi-agent environments, Grid, Cloud and others)	1	2	3	4	5
15. To develop systems for the quality of designing ES, models of systems and processes, to apply mathematical optimization techniques in the process of ES design	1	2	3	4	5
16. Other (please specify)					

Thank you for your participation in the survey. The results of the survey will be used for the development of the curriculum of the program of the DesIRE project. The results of the survey will be used for the development of the curriculum of the program of the DesIRE project.

DesIRE logo and contact information.

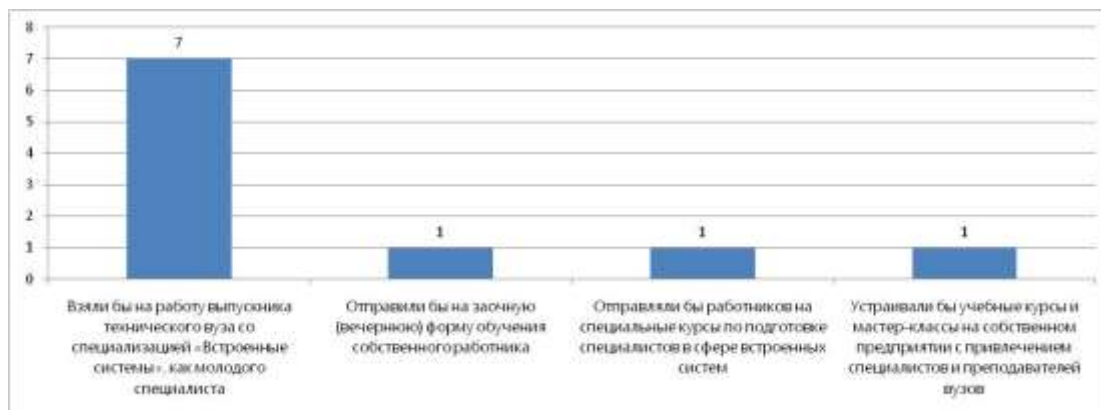


- Employers opinion analysis



### Necessity of specialists in the field of embedded systems

### Necessity of additional specialization "Embedded Systems"





- Employers opinion analysis

## Key competencies:

- «Using of opportunities of local networks and the Internet - technologies in systems design»
- The implementation and testing of ES software components»





# Gender balance





Tempus

Development of Embedded System Courses with implementation  
of Innovative Virtual approaches for integration of Research,  
Education and Production in UA, GE, AM

# Thank You for Your Attention

