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DesIRE Implementation in ZNTU

Galyna Tabunshchyk

Prof. Software Tools Department

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New Laboratory of Embedded System and Virtual Engineering

Teaching for teachers and MC

- Organizing courses for the teachers and researchers in ZNTU

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

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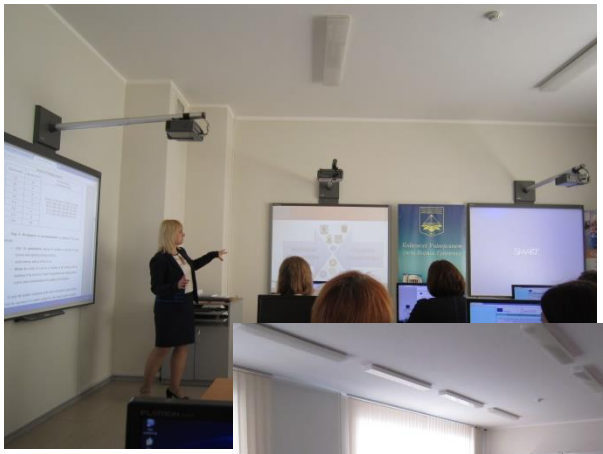
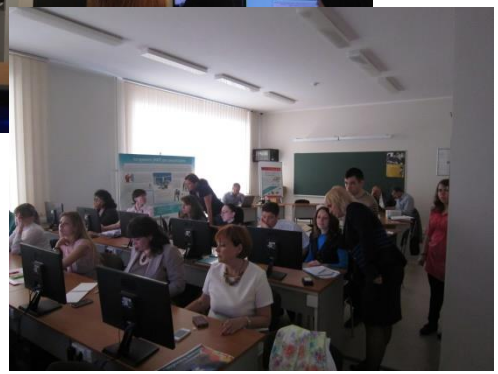
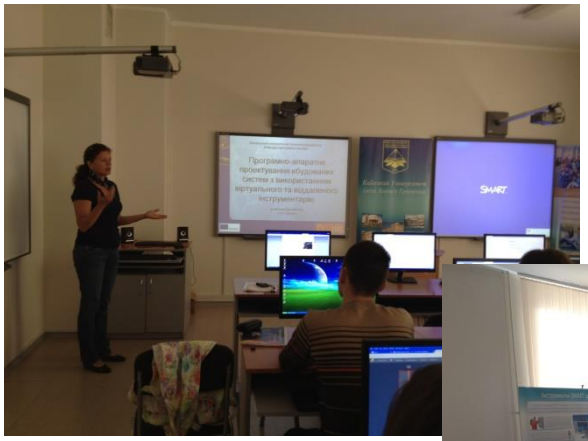
Monitoring in Kiev and Teaching for teachers







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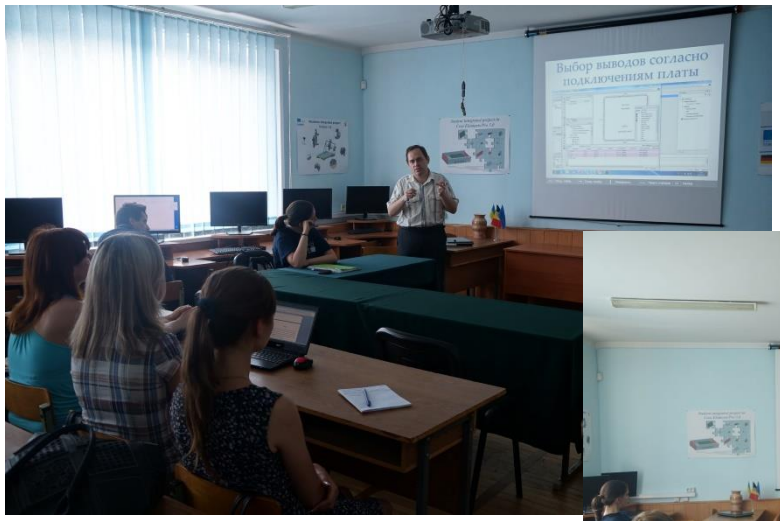
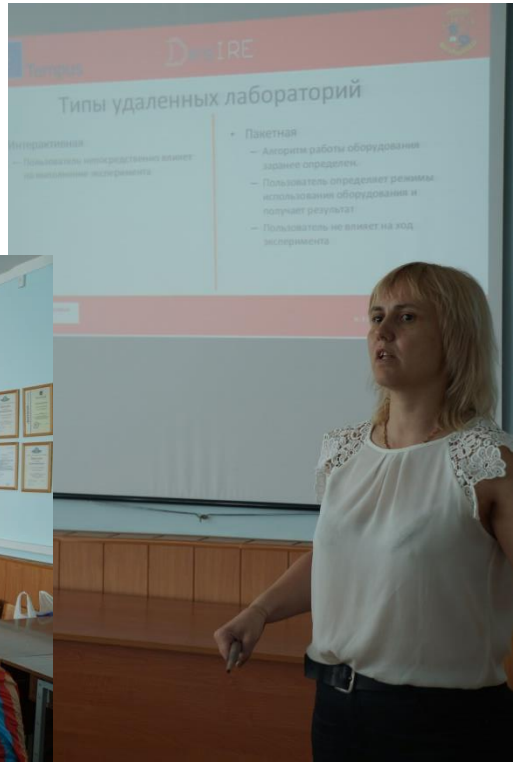
Teaching the teachers after Spring school in Ilmenau





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Master Classes in ZNTU

ZAPORIZHZHYA NATIONAL TECHNICAL UNIVERSITY

Guest Lecture

DesIRE

Co-funded by the Tempus Programme of the European Union

Workshop on the VHDL basics

by Ing. Dirk Van Merode MSc.

Dirk Van Merode will deliver this lecture while in Zaporizhzhya for the Tempus project **Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM (DesIRE)**

October 16, 2015
Software Department
building III, room 57
10:05 a.m.

Goal

✓ To explain the use of hardware description languages.
✓ To show the participants basic logic gates, combinatory logic and sequential logic with the use of VHDL on a Xilinx FPGA-board.
✓ To introduce the ISE software.

Abstract

FPGA's in embedded systems are omnipresent. They are used in a number of applications, being it ASIC-design for chip-emulation and fast time-to-market, being it in high-data-throughput telecommunication and Digital Signal processing. To work and to teach Digital System Design with FPGAs is rather complex, due to the fact that the principles behind describing hardware are somewhat different with traditional programming software. In this view, it is a good idea to start off with basic gates, to get a fundamental knowledge on the way these interesting components work.

About the Speaker

In 2002 Dirk Van Merode finished his engineering studies in Electronics to become a Master in Science. His first educational experience was in secondary education in electricity and electronics, to earn his certificated in pedagogical aptitude. Dirk moved to Lessius University College, currently renamed Thomas More University College, in 2007, to take up a teaching assignment and to do research. His field of expertise is in digital systems design, printed circuit board design and production, and audio-video production. Research topics are mainly in European projects, both on curriculum development and student and staff mobility with countries outside the EU. Dirk also did some in-depth research in space applications and satellite development. Currently he is project coordinator of the DESIRE Tempus project, Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM " – 544091-TEMPUS-1-2013-1-BE-TEMPUS-JPCR. For the department electronics – ICT he is the international coordinator.

64, Zhukovskogo st.
Zaporizhzhya
+38(061) 769 82 67
galina.tabunshchik@gmail.com
www.zntu.edu.ua

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Master Classes in ZNTU

ZAPORIZHZHYA NATIONAL TECHNICAL UNIVERSITY

Guest Lecture

CREO as a tool for virtual prototyping

by Dr ing Peter Arras, Phd

Peter Arras will deliver this lecture while in Zaporizhzhya for the Tempus project
Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM (DesIRE)

MMATENG

DesIRE

Co-funded by the Tempus Programme of the European Union

October 15, 2015
Software Department
building III, room 57
10:05 a.m.

Goal

✓ To explain the process of integrated mechanical design and virtual prototyping.
✓ To introduce the CREO-design software and interesting modules.

Abstract

Mechanical design switched from drawing oriented to model oriented design over the last decade. In a model oriented design you make a virtual prototype in the design software in which the design has all properties of the real object and behaves as the real objects. This allows for virtual prototyping and testing and as such for shorter and more robust design cycles: less physical prototypes are necessary or can sometimes be completely eliminated, saving in time and costs.

CREO (PTC) is a state of the art 3D-design software incorporating all possibilities for an integrated design (CAD), manufacturing (CAM), simulation (FEA, Multi-body Simulation) approach in mechanical engineering.

About the Speaker

Dr ing Peter Arras, KU Leuven, faculty of engineering technology, graduated as engineer in electro-mechanics at the KIH De Nayer (Belgium) in 1985. He received his PhD degree in 2014 at the University of Constantine the Philosopher in Nitra (Slovak Republic) on remote labs in teaching of material sciences.

Dr ing Peter Arras first worked as a lecturer for manufacturing techniques and later for mechanical design related topics in the engineering bachelor and master degree studies. His field of expertise is concerned Computer Aided Engineering, CAD/CAM-systems and numerical techniques. On this he also worked as consultant for local industry.

He is currently responsible for the curricula of the master in engineering in electro-mechanics at the technology campus De Nayer of KU Leuven, and international coordinator for this campus.

Closely involved in teaching he ran several national and international educational projects for the faculty of engineering. On the national level he organized for 14 years retraining courses to mechanical designer for longtime unemployed and for 10 years job-trainings for engineers and designers in the use of CAD-systems.

In international projects he was local coordinator for tempus NCR, tempus CRIST, tempus PROMENG and the Erasmus Mundus MANECA project.

Dr ing. Peter Arras is currently project coordinator for tempus MMATENG (Modernization of two cycles (MA, BA) of competence-based curricula in Material Engineering according to the best experience of Bologna Process), 543994-TEMPUS-1-2013-1-BE-TEMPUS-JPCR.

64, Zhukovskogo st.
Zaporizhzhya
+38(061) 769 82 67
galina.tabunshchik@gmail.com
www.zntu.edu.ua

Links

KU Leuven: ow.ly/euven.be/English
Tempus CRIST (Curriculum Reform in Space Technology in Kazachstan, Russia, Ukraine) www.crist-kru.eu
Tempus NCR (Neues Curriculum in Raumfahrttechnik) www.ncr-tgai.eu
Tempus PROMENG (PRactice Oriented Master Programmes in ENGineering in RU, UA, UZ) www.promeng.eu
Tempus MMATENG (Modernization of two cycles (MA, BA) of competence-based curricula in Material Engineering according to the best experience of Bologna Process) www.mmateng.eu
Erasmus Mundus MANECA (Mobility Academic Network between EU and Central Asia) www.maneca-em.org
CREO www.ptc.com

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Master Classes in ZNTU

ZAPORIZHZHYA NATIONAL TECHNICAL UNIVERSITY

Guest Lecture

DesIRE

Co-funded by the Tempus Programme of the European Union

Demonstration of developed courses at Thomas More
ECAD introduction

by Ing. Dirk Van Merode MSc.

Dirk Van Merode will deliver this lecture while in Zaporizhzhya for the Tempus project **Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM (DesIRE)**

October 15, 2015
Software Department
building III, room 24
10:05 a.m.

Goal

✓ To explain the process of developing state-of-art printed circuit board.
✓ To show the participants the relation between design work and automated production of electronic equipment.

Abstract

Developing PCBs for professional goals and consumer end-products is not an arbitrary task. The designer needs to take a lot of parameters into account, the components' cost, deliverability, ease of implementation and lifetime, PCB manufacturability and PCB assembly. Designers should design for X, where X stands for testability, manufacturability, maintainability and so on. Altium is powerful tool to help designers with their task, with a lot of options available to increase productivity and decrease error margin. The workshop helps users to overcome the initial start-up with the software.

About the Speaker

In 2002 Dirk Van Merode finished his engineering studies in Electronics to become a Master in Science. His first educational experience was in secondary education in electricity and electronics, to earn his certificated in pedagogical aptitude. Dirk moved to Lessius University College, currently renamed Thomas More University College, in 2007, to take up a teaching assignment and to do research. His field of expertise is in digital systems design, printed circuit board design and production, and audio-video production. Research topics are mainly in European projects, both on curriculum development and student and staff mobility with countries outside the EU. Dirk also did some in-depth research in space applications and satellite development. Currently he is project coordinator of the DESIRE Tempus project, Development of Embedded System Courses with implementation of Innovative Virtual approaches for integration of Research, Education and Production in UA, GE, AM " – 544091-TEMPUS-1-2013-1-BE-TEMPUS-JPCR. For the department electronics – ICT he is the international coordinator.

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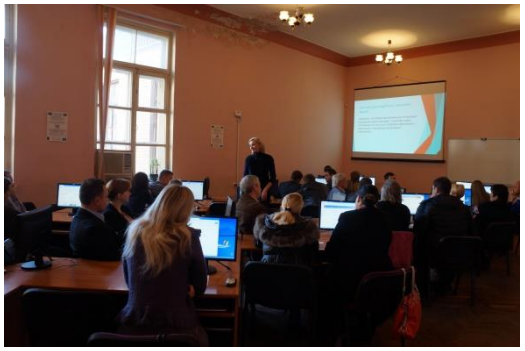
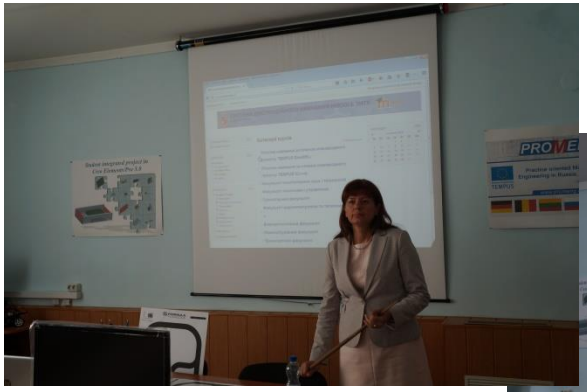
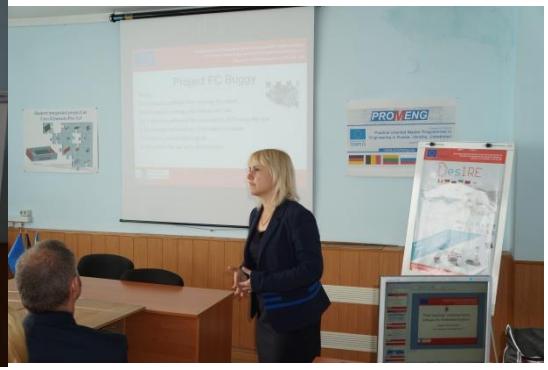
Master Classes in ZNTU







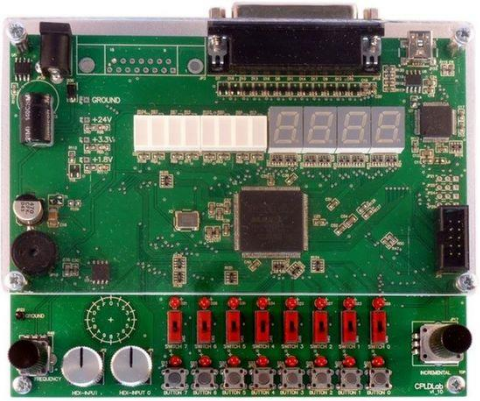
Pilot teaching

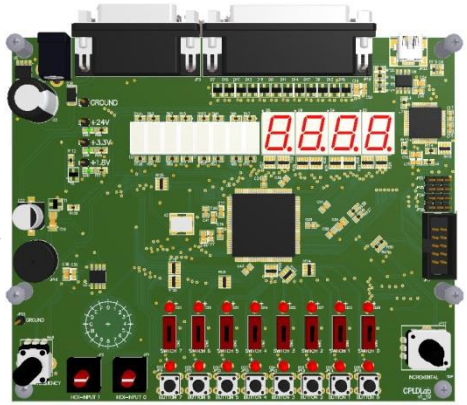
	Discipline/Module	Basic Information
1	Module name: Digital Electronics Course name: Digital Electronics and Microprocessors	Total – 108 h Contact – 54 h Study Cycle -BA
2	Module name: Microcontrollers Course name: Digital Electronics and Microprocessors	Total – 108 h Contact – 48 h Study Cycle -BA

Lecturer

Sergii Morshchavka PhD. Eng.
Assoc. Prof. on Radio Electronics and Telecommunication Departme t
svmorsh@mail.ru

- **Idea**
  - It is proposed to use PLD as a linkage for all parts of the course and freely distributed EDA tools as a major environment for development and simulation on real and virtual devices





Course development

- **Digital electronics module covers**
  - Lectures
    1. Combinational devices
       - Boolean arithmetic as basis for digital electronics
       - The basic and universal logic units
       - Adders and digital comparators
       - Codes and coding in digital electronics
       - Coders, decoders
       - Multiplexors, demultiplexors
       - Arithmetic-logic units

- **Digital electronics module covers**
  - Lectures
    2. Sequential devices
       - Simplest triggers
       - Triggers with static and dynamic (flip-flops) sync
       - Counters and divider of frequency
       - Registers, shifter registers
       - RAM, ROM, bus conditioners and other parts of Microprocessor systems
       - CPLD, FPGA
       - The main technologies of digital ICs and their features

- **Digital electronics module covers**
  - Laboratory works
    1. Combinational devices
       - Logical elements
       - Coders, decoders
       - Multiplexors, demultiplexors
       - Arithmetic-logic units

- **Digital electronics module covers**
  - Laboratory works
    2. Sequential devices
       - Triggers with static sync (latches)
       - Triggers with dynamic sync (flip-flops)
       - Counters and divider
       - Registers, shifters

- **Microprocessors module covers**
  - Lectures

    Review of PIC microcontrollers
    - Microcontrollers basics: architectures, features, etc. Memory organization for program and data, addressing, instruction organization and set for PIC16. Basic peripheries for PIC16

    Review of AVR microcontrollers
    - The AVR RISC Microcontroller architecture. Memory organization for program and data, addressing, instruction organization and set for AVR. Basic peripheries of AVR MCU family.

- **Microprocessors module covers**
  - Laboratory works

    Review of PIC microcontrollers
    - The first program for PIC16.
    - Using the main instructions
    - Using ports for the input/output

    Review of AVR microcontrollers
    - Writing “hello World” program for AVR.
    - Learning the basic instruction
    - Using IO on AVR

to be continued …

- Programming of MCU (eq. Embedded Software)
- MCU in Electronic System (eq. Embedded System)
- Digital Signal Processing
- Computers and MCU in Telecommunication

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Informational Technologies for Electronic Device

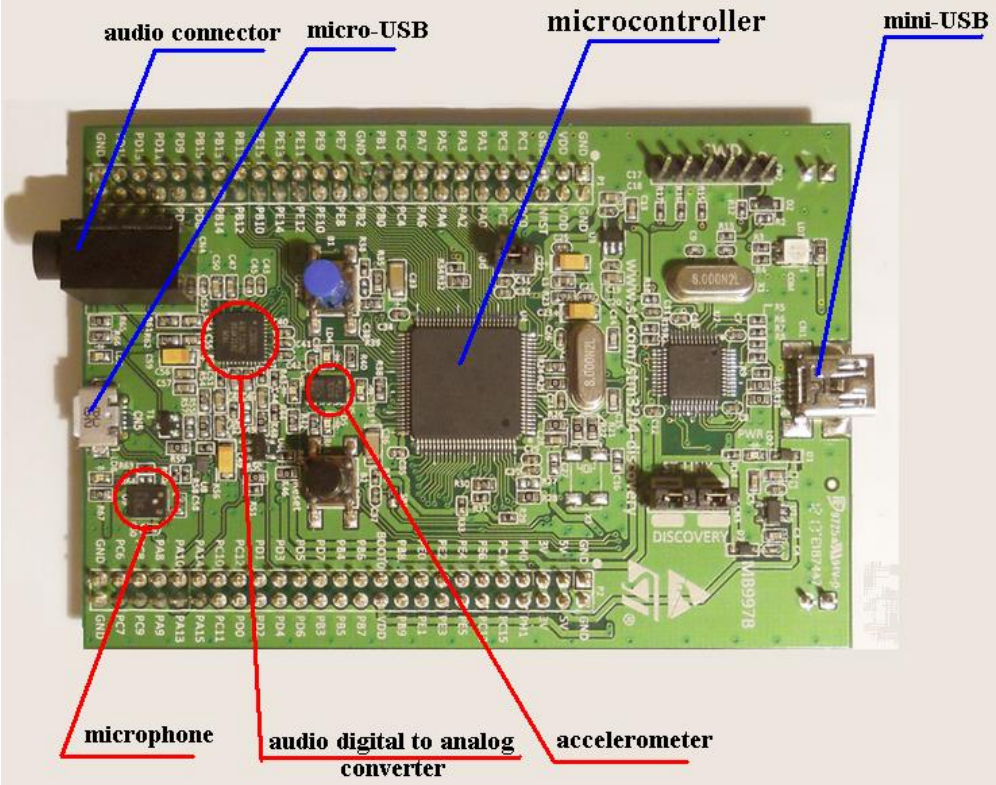
Lecturer

Olexiy Pharaphonov
PhD, Assoc. Prof. of ITED Department
farafon@zntu.edu.ua

Teaching Assistant

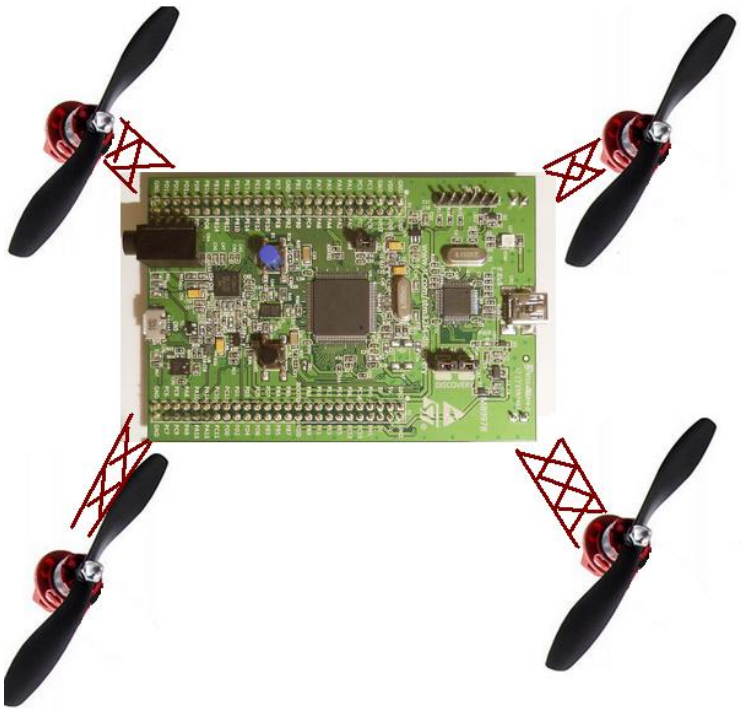
Marina Mischenko
PhD, Senior Lecture

STM32F4DISCOVERY board

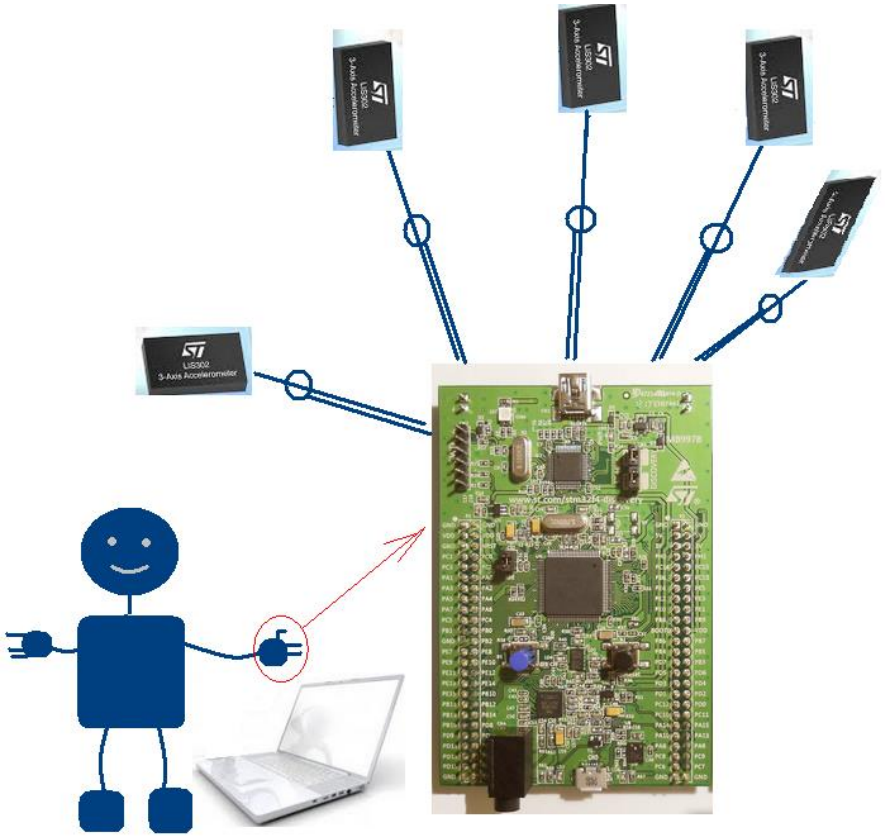


- programming language C and C++
- technical documentation about microcontrollers working
- work with the microcontroller's ports
- install of peripherals
- create a projects and student's research project

Idea of the project to create helicopter



Idea of the project for people with disabilities



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	Discipline/Module	Basic Information
1	CAD/CAM/CAE FOR EMBEDDED SYSTEMS	MsC Total hours 360 Contact hours 144
2	Remote Labs and Virtualization	MsC Total hours 180 Contact hours 64

Lecturer		Teaching Assistant	
Anzhelika V. Parkhomenko **Assoc. Prof. Software Tools Department**		Olya Gladkove	

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CAD/CAM/CAE FOR EMBEDDED SYSTEMS

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultation	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
Module 1. Basics of CAD/CAM/CAE	32				32		64	80	
1.1 Structure, possibilities and classification of modern CAD/CAM/CAE-systems	8						8	40	Reading literature and preparing case-study
1.2 MCAD structural design (by means of Creo) 1.2.1 Part modeling 1.2.2 Assemblies 1.2.3 Drawings	12				20		32	20	Working on individual tasks and preparing labs reports
1.3 ECAD electronic and schematic design (by means of ALTIUM) 1.3.1 Before designing 1.3.2 Integrated schematic and PCB design	12				12		24	20	Working on individual tasks and preparing labs reports

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CAD/CAM/CAE for Embedded Systems

Module 2. Advanced techniques.	**32**				**48**		**80**	**136**	
2.1 MCAD structure design (by means of Creo) **2.1.1 Sheetmetal modeling** **2.1.2 Family tables** **2.1.3 Automatic assembly** **2.1.4 Layouts** **2.1.5 Surfaces modeling** **2.1.6 Numerical simulations**	10				20		30	40	**Working on applied task and preparing presentation of integrated project**
2.2 Introduction to the technology of CAM (Computer Aided Manufacturing)	8				8		16	20	**Working on individual tasks and preparing labs reports**
2.3 Finite Element Analysis **2.3.1 Principles of FEA** **2.3.2 Case studies for structural strength calculations (by means of Mech Wildfire)**	4				8		12	36	**Working on individual tasks and preparing labs reports**
2.4 ECAD electronic and schematic design(by means of ALTIUM) **2.4.1 Routing strategies** **2.4.2 Design for testability**	**10**				**12**		**22**	**40**	**Working on applied task and preparing presentation of integrated project**

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Remote Labs and Virtualization

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultation	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
Module 1. Basics of ES development	8						8	64	
1.1. New approaches to ES design and production activity based on virtual engineering and remote experiments	2						2	20	Reading literature and preparing presantation
1.2 Analysis of Embedded Systems features and market. The phases of the life cycle of embedded system	2						2	20	Reading literature
1.3 Embedded systems requirements analysis and creation of project documentation	4						4	24	Working on individual tasks

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Remote Labs and Virtualization

Module 2. Using Remote and Virtual tools for ES design	24				32		56	52	
2.1 Approaches to embedded systems hardware realization. Embedded systems based on microcontrollers. Stages of microcontroller system design. Atmel microcontrollers architecture.	8				4		12	14	Working on individual tasks and preparing labs reports
2.2 Approaches to embedded systems software realization. Software engineering medium Atmel Studio and Arduino IDE.	8				10		18	14	Working on individual tasks and preparing labs reports
2.3 Design of embedded control systems using lab GOLDI and RELDES.	4				10		14	12	Working on individual tasks and preparing labs reports
2.4 Testing embedded systems' virtual prototype using Proteus and Arduino simulators.	4				8		12	12	Working on individual tasks and preparing labs reports
Is viso	32				32		64	116	

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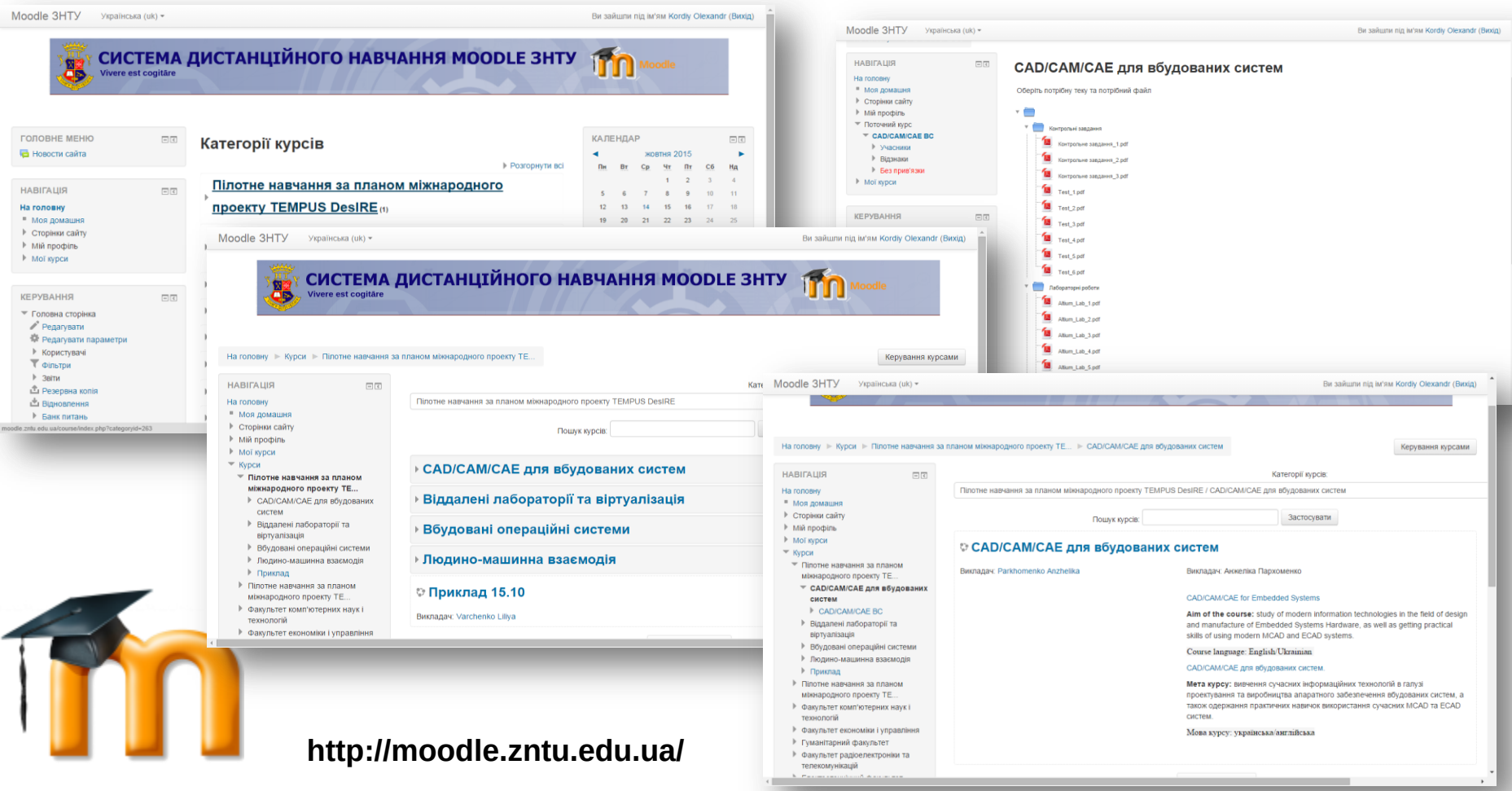

http://moodle.zntu.edu.ua/

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Software for Embedded systems

	Discipline	Basic Information
1	Embedded OS	Total 105 h Contact 35 h BA
2	GUI Development	Total 60 hours Contact 30 hours BA

Lecturer	Teaching Assistant
	
Sergiy Serdjuk Assoc.Prof of Software Tools Department serdjuksn@mail.ru	Zhanna Kaminsaya kamzhana@gmail.com

Embedded OS

1. To know the principles of the Linux shell programming	**2**				**4**		**6**	**4**	**Writing Scripts**
2.To know the principles of the /dev/mem file in Linux	2						2	8	Access to RAM
3. To know the Linux device driver sysfs and spi interface	4						4	8	The Linux device driver programming
4. Cross-compile a Linux kernel (with some changes)	4				3		7	8	Application of gss
5. File and file system structure control					3		3	8	Configure and administer Linux
6. Process control					2		2	8	
7. Distribution of user rights					1		1	4	
8. Read some I2C and SPI data					4		4	8	Embedded data communication
9. Write a SPI sysfs driver					6		6	14	The Linux device driver programming

GUI Development

1 Understanding of ergonomic requirements for each component of the "man-machine-environment" (MME) such as: human operator, technical facilities, workplaces, production environment	**3**				**2**		**5**	**2**	
2. Knowledge of methods utilizing formalization and modeling options for operator activity applicable to embedded system	3				2		5		Study of specialized tools
3. Understanding the principles of information systems virtual reality design	4						4	4	
4. GUI development					8		8	4	Human-centered design
5. GUI usability testing	2				6		8	4	GUI assessment
6. Quantitative assessment of human operator's activity								16	Improving the efficiency and quality of an operator's activity

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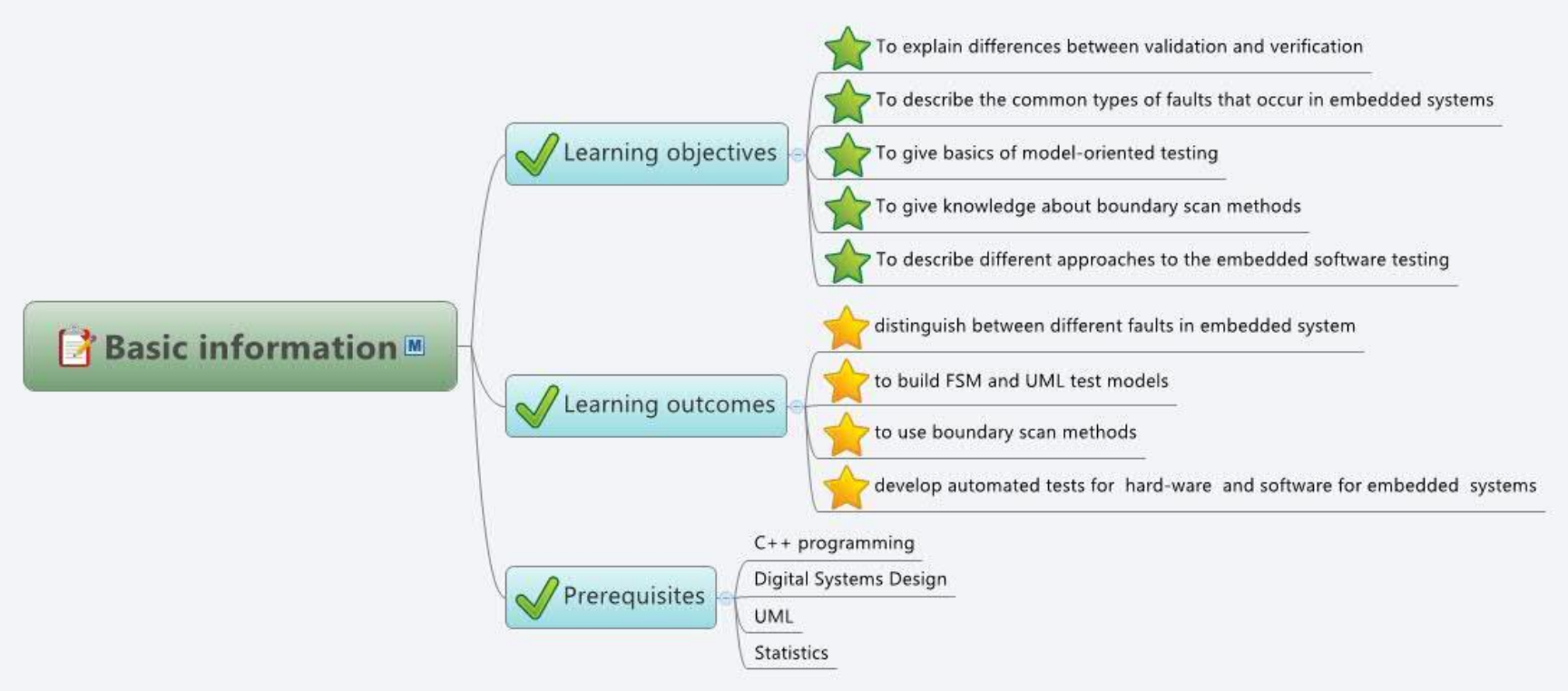
Software for Embedded systems

	Discipline	Specialty	Developers
1	C for Embedded Systems	Informational Technology of Design	Prof. Galyna Tabunshchyk
2	Embedded Software Development	Software Engineering Informational Technology of Design	Prof. Galyna Tabunshchyk Senior Lecture Natalya Mironova Ba Student Evgeniy Tverdohleb
3	Quality Engineering	Informational Technology of Design	Prof. Galyna Tabunshchyk Seniour Lecture Tetyana Kaplienko
4	ES Software Testing	Artificial Intelligence	Prof. Galyna Tabunshchyk Seniour Lecture Tetyana Kaplienko
5	FC Buggy	Project Work	Prof. Galyna Tabunshchyk

ES Software Testing



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Basic Information

Duration:72h

Lectures: 36 h

Lab works: 36 h

Lecturer		**Teaching Assistant**	
Galyna TABUNSHCHYK , PhD, Prof. galina.tabunshchik@gmail.com		Tatyana Kaplienko, tabr007@yandex.ua	

Week	Subject
1	Introduction
2	Validation and verification of the digital systems
3	Faults in Embedded Systems. Hardware Faults
4	Software-Hardware covalidation Faults Model
5	Model based testing
6	FSM Models for test generation
7	Midterm Exam
8	Testing of Embedded core-based systems ob chips
9-10	Boundary scan methods and standards.
11	Virtual instrumentation for boundary scan
12	Embedded software testing. Functional testing
13	Embedded software testing. Coverage testing,
14	On-line testing of embedded systems
15	Comparison of IT technologies used for verification and validation
16	Review, Exam

Experiments, Projects, Lab Works	Subject
Lab work 1	Working with Git
Lab work 2	Functional Testing with Basys 2 Board
Lab work 3	Functional testing of embedded software
Lab work 4	FMS based testing with remotes experiments
Lab work 5	Remote functional testing

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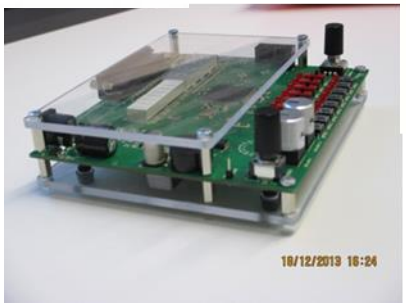
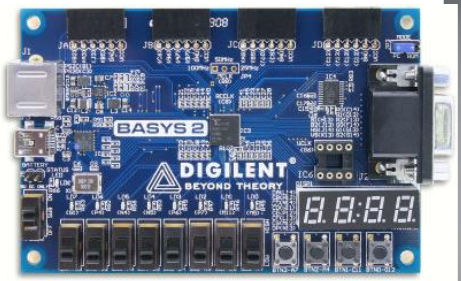
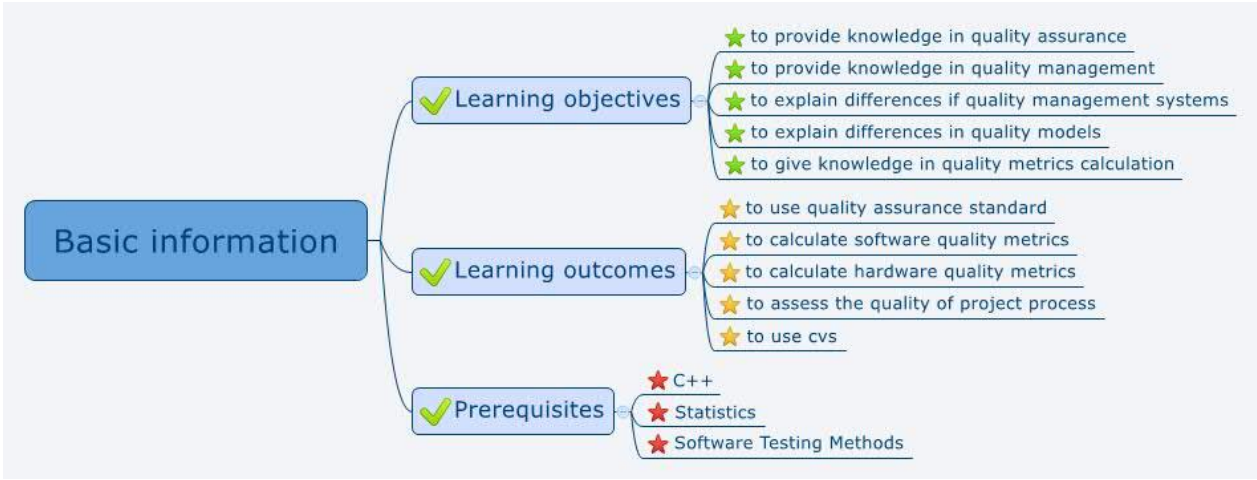




Quality Engineering

Total hours 108h

- Lectures: 12 h
- Lab works: 12 h
- Self work 60 h



Week	Subject
1	Introduction
2	Quality Management Philosophy.
3	The economics of Quality
4	Quality Engineering
5	Quality Control Methods
6	Configurational Management
7	Software Quality Assurance
8	Software quality system organization.
9	Software quality models
10	Software quality metrics
11	Software certification
12	Licenses of software and documentation

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Embedded Software Development

Total hours 108h

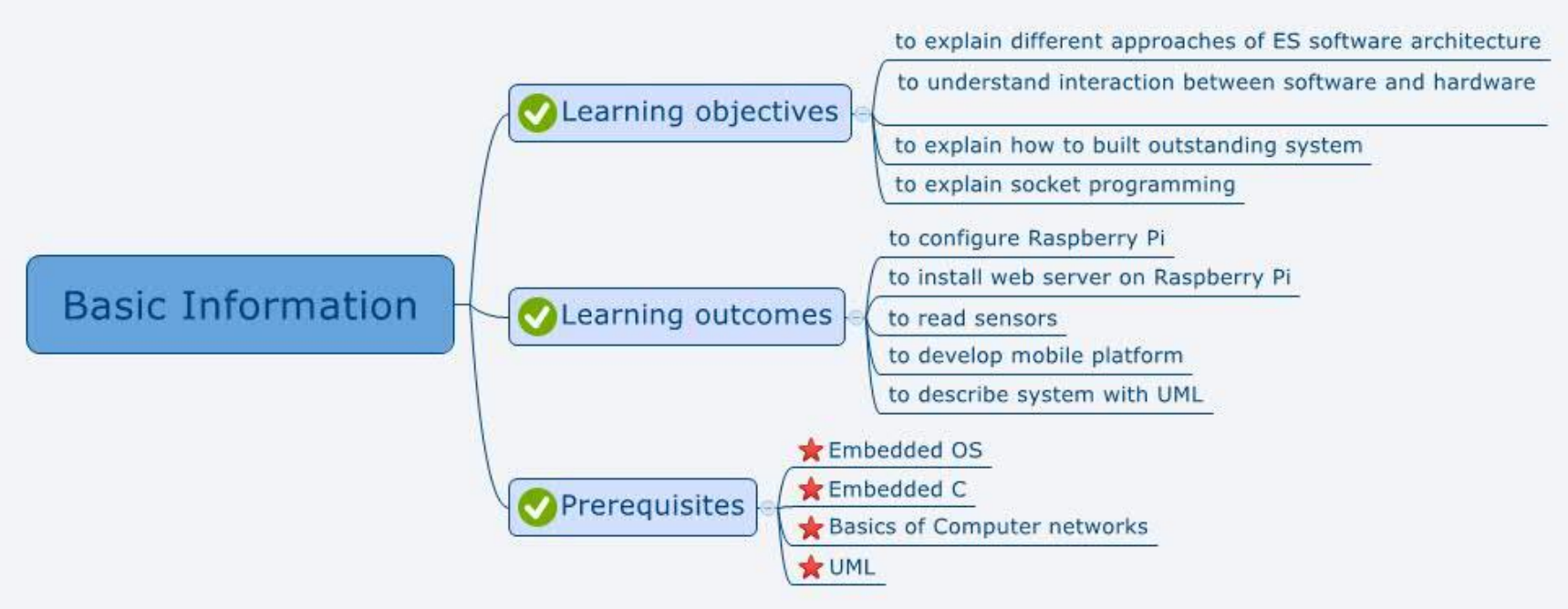
- Lectures: 12 h
- Lab works: 24 h
- Self work 72 h

Lecturer
Galyna TABUNSHCHYK ,
PhD, Prof.
galina.tabunshchik@gmail.com

Teaching Assistant

Natali Myronova
natali.myronova@gmail.com

Eygeniy Tverdokhleb
junta.kristobal@gmail.com


Basic Information
Learning objectives
to explain different approaches of ES software architecture
to understand interaction between software and hardware
to explain how to built outstanding system
to explain socket programming
Learning outcomes
to configure Raspberry Pi
to install web server on Raspberry Pi
to read sensors
to develop mobile platform
to describe system with UML
Prerequisites
Embedded OS
Embedded C
Basics of Computer networks
UML

Week	Subject
1	Introduction
2-3	Modelling of software for Embedded Systems
3-4	Standard component models
5-6	Architecture of the software for Embedded Systems
6-8	Templates for Software Architecture for Embedded Systems
9-10	Socket programming
11-12	Programming Linux Socket

Experiments, Projects, Lab Works	Subject
Lab work 1	Configuring Raspberry Pi
Lab work 2	Installing Web-server at Raspberry Pi
Lab work 3	Developing QT application at Raspberry Pi
Lab work 4	Reading sensors from extension board
Lab work 5	Developing Project on Raspberry Pi

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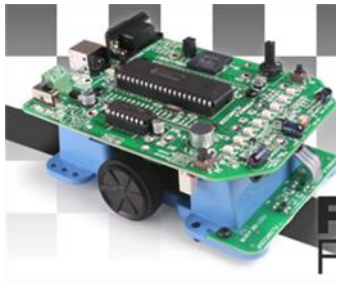
Project FC Buggy



Tasks

1. To develop software for moving the maze
2. Do develop software for follow the line
3. Do develop software for rout search, following the line
4. To develop software for rout search in maze
5. To make musical dancing car
6. To control the car with smartphone

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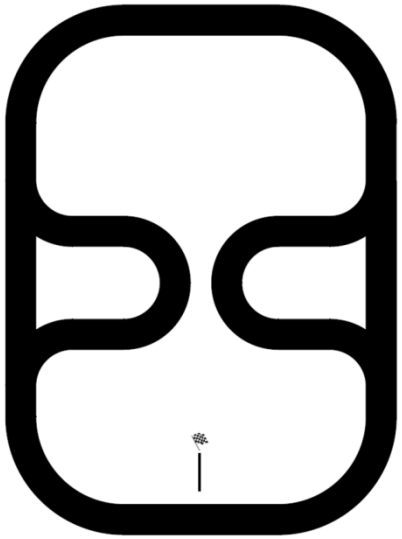
V. Okhmak

B. Klochko



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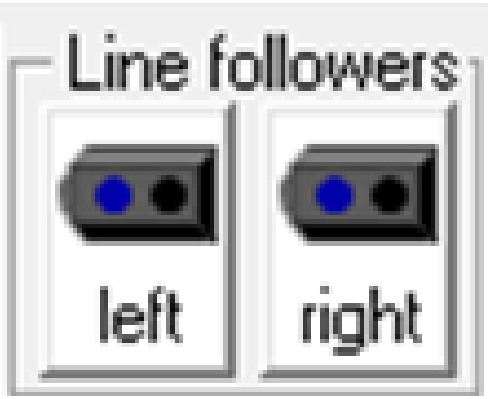
Working with sensors Formula Flowcode Buggy



Сенсоры определения цвета поверхности

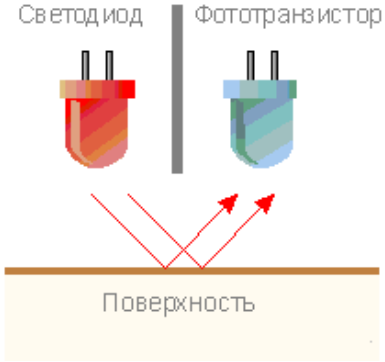
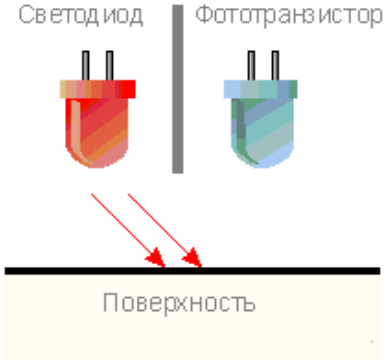


Схема отражения света



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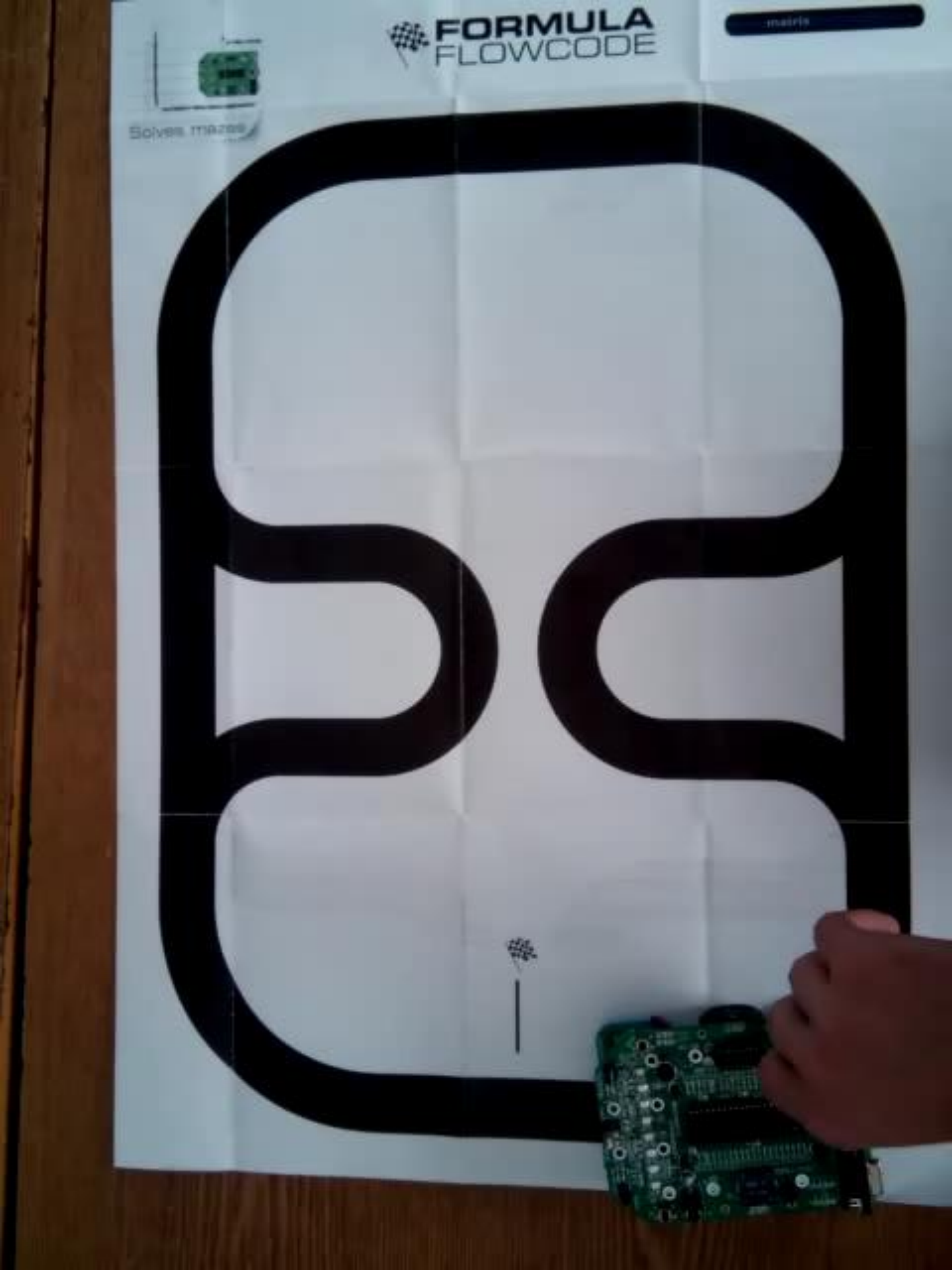
FORMULA
FLOWCODE

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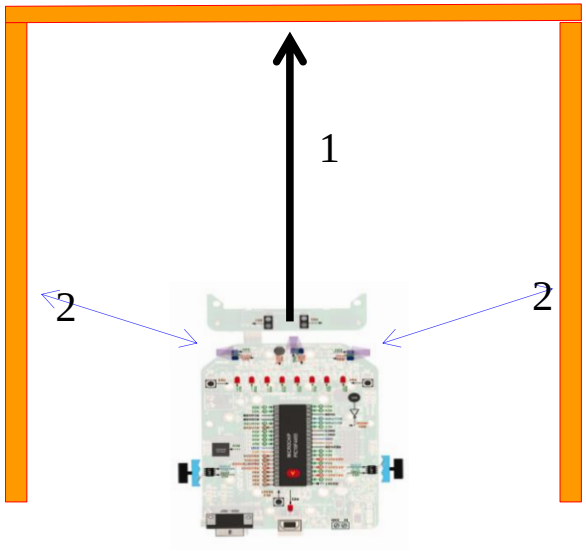

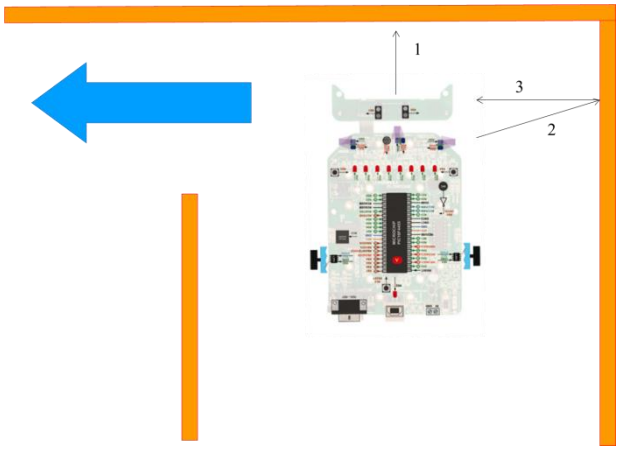

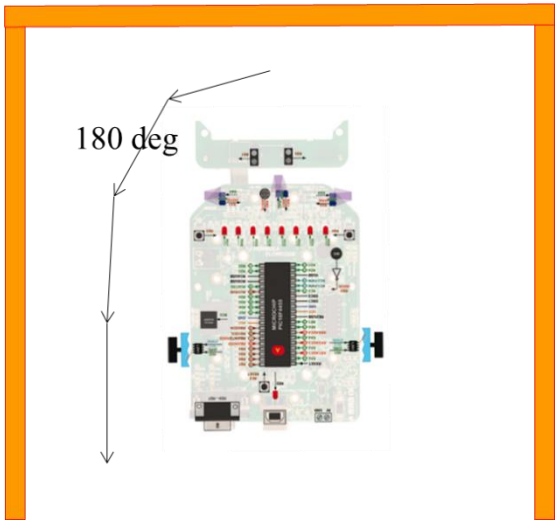

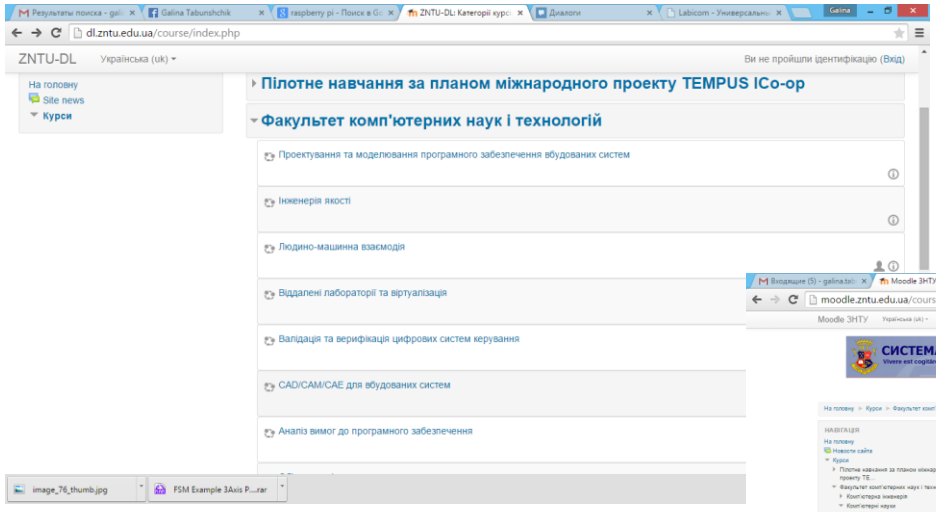
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На головну
Site news
Курси
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Факультет комп'ютерних наук і технологій
Проектування та моделювання програмного забезпечення вбудованих систем
Інженерія якості
Людино-машинна взаємодія
Віддалені лабораторії та віртуалізація
Валідація та верифікація цифрових систем керування
CAD/CAM/CAE для вбудованих систем
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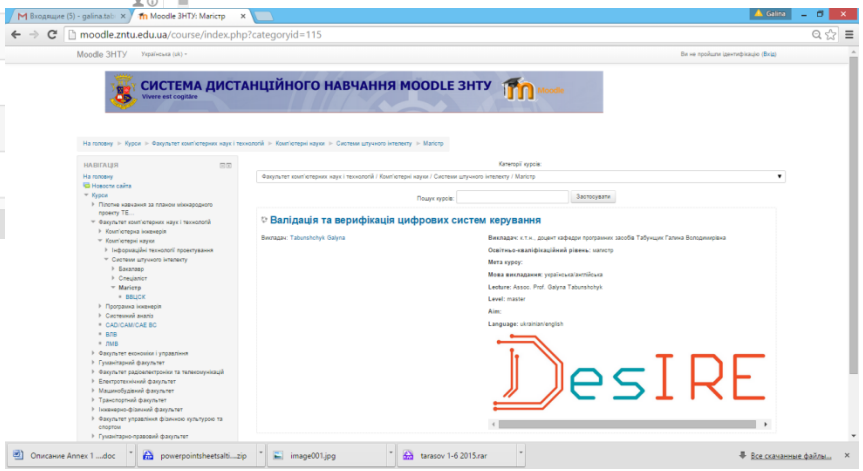
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СИСТЕМА ДИСТАНЦІЙНОГО НАВЧАННЯ MOODLE ЗНТУ
Валідація та верифікація цифрових систем керування
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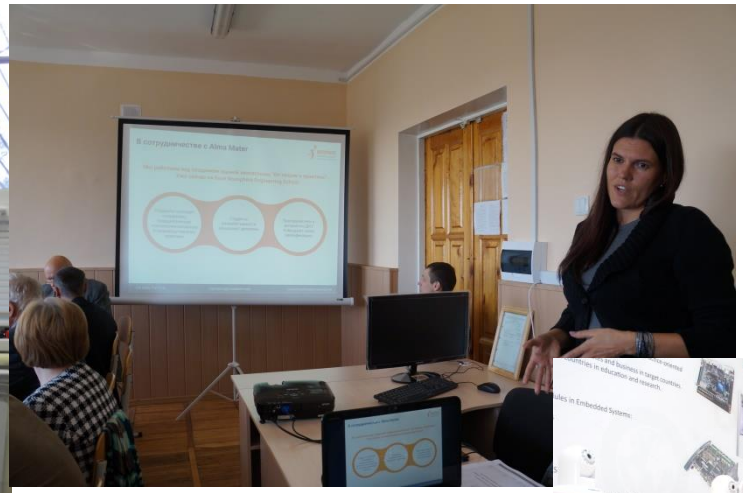
Dissemination



Thank You for Your Attention