Measurement and Testing
Course Syllabus

Basic Information

This course contributes to the requirements for the Degree of MSc in Computer Science

Title of the Academic Program	Master's Degree Program *Digital intelligent control systems* (delivered in English)
Type of the course	core /mandatory
Course period	1 semesters from October, the 1st to February, the 1st (18 weeks)
Study credits	7 ECTS credits
Duration	252 hours
Language of instruction	English
Academic requirements	– BSc degree in Computer Science or equivalent (transcript of records), – good command of English (certificate or other official document) **Prerequisites** **To know:** fundamentals of electrical engineering, Boolean algebra, real-time systems. **Possess:** programming.

Course Overview

Description

"Measurement and Testing" is a core course.

The course will provide students with skills in design, industrial operation and data analysis of electronics test-systems. The course includes a review of modern test equipment and software. During course, a number of practical tasks are being solved. For example: designing test systems for electronic devices, on-board systems, science and industrial equipment, etc.

Applying test-systems requires skills in programming, electrical and electronics design and professional CAD. This course provide students with the complete set of skills in modern test-system design.

Students will learn Industrial standards, practical methods of design test-system by National Instruments, design of application in NI LabView®.

The course will use National Instruments – test and design equipment.

Special Features of the Course

In laboratory on practical classes, as examples, you will solve actual tasks of manufacturing enterprises.

The aim of the course is to get students the practical skills in the development of test complexes, as well as academic knowledge for independent scientific work.

Course Objectives

- Consider current trends in the field of testing electronic equipment at modern industry.
- Explore the theoretical foundations of testing and terminology based on industrial standards
- To obtain basic skills in the selection and assembly the test-systems equipment.
- To obtain basic skills in developing software for test-systems.
- To obtain experience in field of testing electronic.

Learning Outcomes of the Course

By the end of the course, students will know:

- Modern technologies, algorithms and methods of testing electronic equipment.
- Testing terminology and basic standards adopted by industry and science.
- Approaches and methods of testing electronic equipment using hardware and software tools from National Instruments.

By the end of the course, students will be able to:

- To make a reasonable selection, design and assembly the hardware and software of test system.
- Design algorithms and develop control software for test systems.
- Conduct tests according to the developed programs and methods.

Course Structure

Learning Activities	Hours
Lectures	18
Practice sessions / Seminars,	36
Self-study Assignments	162
Final Exam (including preparation)	36
Total study hours	**252**

Detailed Schedule

Week	Lectures	Practice sessions / Assignments	Hours[1] Lec/Lab/HA
Semester 1			
1, 2	Introduction. Basic concepts and definitions. The modern automated information processing and control systems. Basic Industrial standards and technology of electronic devices testing.	Essay. An overview of technologies for control and testing of electronic equipment at industrial enterprises	2/0/31
3, 4	National Instruments policy. NI LabVIEW® review. The graphical programming for projects design.	Design and debugging an simple automated information system . For example: "Calculator".	2/4/21

[1] Hours designed for Classroom sessions, Web-sessions, Home Assignments etc.

	Administrating, build and debugging of automated information systems.		
5 - 9	Immersion in the graphical programming environment NI LabVIEW® Modular programming. From loops and conditions to optimizing code in LabVIEW®. Decorating code and using external code in LabVIEW®.	Develop an automated information system for checking cables and connectors of electronic equipment.	5/14/29
10 - 12	Complex design of hardware and software measurement and testing systems	Develop an automated information system for remote control of a virtual instrument by TCP/IP – networks protocol.	3/10/20
13, 14	The simplest methods of collecting data from objects of control. An overview of the main types of test equipment.	Design a optical-based, galvanically isolated communication system.	2/7/10
15 - 17	Automated information processing and control systems in industry. Examples of implementation of hardware and software systems for automation in industry. Programming of control and testing equipment in text languages.	Final laboratory project design and presentation.	4/1/51
18	**Final Exam**		**36**
			252

Course Instructor and Tutor, Contact information

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Assessment

Assessment strategy	Points, max	Evaluation criteria
Lab works	40	Practical questions
Final exam	60	2 questions that require preparatory reading and knowledge of the concepts explained

Grading policy for final assessment is:

- A (excellent work) 91–100 points
- B (above average) 81–90 points
- C (average) 71–80 points
- D (below average) 50–70 points
- F (failed) < 50 points

Attendance Policy

Students are expected to attend classes regularly. In case of missing an in-lab activity a student should perform additional work submitted to the instructor within a week after a class was missed.

Every topic involves an assignment. The final mark will rely on the same grading policy as for the final exam.

Web page of the course

Course materials and required reading materials are available on the webpage of the course **Measurement and Testing**, SibFU E-learning portal, www.e.sfu-kras.ru . You must be logged in to access this course https://e.sfu-kras.ru/course/view.php?id=31498.

Core reading

1. Jeffrey Travis, Jim Kring. LabVIEW for Everyone (3rd Edition). Prentice Hall, 2006. p. 1032. ISBN-13: 978-0131856721

2. LabVIEW® TM. FPGA Module. User Manual. National Instruments Corporation. Mar. 2004 Edition. Part Number 370690B-01. p. 62. Access for free: http://www.ni.com/pdf/manuals/370690b.pdf
3. NI myRIO-1900. Quick Start for LabVIEW Users. National Instruments Corporation. Nov. 2019. Part Number 376046C-01. p.4. Access for free: https://www.ni.com/pdf/manuals/376046c.pdf
4. NI myRIO-1900. User guide and specifications. National Instruments Corporation. Jun 2018. Part Number 376047D-01. p.32. Access for free: https://www.ni.com/pdf/manuals/376047d.pdf

Facilities, Equipment and Software

Facilities
Laboratory computer class room with internet access.

Software:
National Instruments LabVIEW 2015 MyRIO, licensed by Siberian federal university;
Microsoft Office®.

Laboratory equipment:
National Instruments MyRIO-1900 multifunctional board;
Sensors, actuators and connectors – bag;
Additional National Instruments devices.

Control, testing and measuring equipment:
Digital oscilloscopes PV6501, GW Instek GDS-8205, Tektronix TPS 2024;
Multimetr ABM-4307;
Signal generator GW Instek SFG-2010.