COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of computer measuring systems [S1MNT1>PKSP]

Course

Field of study
Mathematics of Modern Technologies

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematics, computer science, metrology. The ability to effectively self-educate and awareness of the continuous expansion of knowledge and skills, as well as teamwork. Ability to comply with the rules of the university study process.

Course objective

Acquainting with selected modern methods of measuring process automation. Learning the principles of remote operation of devices, data acquisition and processing with the use of mathematical algorithms in a computer measurement system.

Course-related learning outcomes

Knowledge:
• the student has basic knowledge of the construction and design of complex measurement systems, knows and understands the need to apply selected issues from other disciplines of the field of study [K_W09(P6S_WG), K_W11(P6S_WG)];
• thestudentknowstheprinciplesandtechniquesofremotesignalacquisitionincomputermeasurement systems with the use of selected programming tools [K_W07(P6S_WG), K_W08(P6S_WG)];

• the student knows the general principles of operation and use of measuring devices for remote control via the communication bus, in compliance with health and safety rules [K_W13(P6S_WK)].

Skills:
• the student is able to obtain information from literature, databases and other sources, is able to integrate the obtained information, make its interpretation and critical evaluation [K_U07(P6S_UW), K_U08(P6S_UW)];
• the student knows how to creatively design measurement systems, apply knowledge from other disciplines, use the opportunities offered by new technologies, taking into account the limitations of the current level of knowledge and technology [K_U 04(P 6S_U W), K_U 05(P 6S_U W), K_U 06(P 6S_U W)];
• on the basis of technical documentation, he is able to control measuring devices for remote acquisition of electrical quantity measurement results [K_U09(P6S_UW)];
• the student is able to select the equipment for the measurement task, set up the measurement system with the computer control, perform the system operation test, estimate the time of the task completion [K_U13(P6S_UW), K_U16(P6S_UO)].

Social competences:
• thestudentisawareofthecriticalassessmentoftheresultsofhiswork,includingintheareaofresearch and analysis [K_K01(P6S_KK)];
• the student is aware of the limitations of his knowledge and the need to constantly improve it resulting from the social role of a technical university graduate [K_K05(P6S_KR)].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: assessment of the knowledge shown in the final test (test, accounting and problem questions, 50% pass threshold), rewarding activity in the classroom;
Laboratory classes: assessment of knowledge and skills related to the implementation of a laboratory task, assessment of the report made in class or at home. Rewarding insights regarding the improvement of the content of teaching materials.

Programme content

Lectures: classification and functional structure of measurement systems. SCPI recommendations, basic information about communication interfaces and programming measuring devices (Agilent, Fluke, Tektronix, Rigol, GW Instek). Remote operation of instruments from a PC, use of mathematical functions, in particular statistical ones, implemented in measuring instruments. Registration to a file, processing and presentation of results from a series of measurements.

Laboratories: planning and implementation of tasks related to the construction of a computer measurement system, remote operation of the device, use of the manufacturer's application, writing a program for remote control and measurement of devices during classes, working in a loop, formatting results, registering to a file, graphic presentation of results.

Course topics

Lectures:
1. Classification and functional structure of measurement systems.
2. Basic information about communication interfaces in measuring instruments.
3. SCPI recommendations, device model, hierarchical structure of the command system, general-purpose instructions.
4. Programming instructions, processing of general entries, separators.
5. Discussion of programming on selected devices from Agilent, Fluke, Tektronix, Rigol, GW Instek, device identification, VISA libraries.
6. The use of mathematical functions, in particular statistical ones, implemented in measuring instruments.
7. Processing and presentation of results from a series of measurements, using a statistical apparatus to develop measurement results.

Laboratories:

1. Planning and implementation of tasks related to the construction of a computer measurement system.
2. Working with specifications and documentation of measuring instrument programming.
3. Remote operation of the device using the manufacturer's application.
4. Writing an application during classes to control a measuring instrument via USB and Ethernet.
5. Staged implementation of the application for the measurement system, remote acquisition of results.
6. Working in a loop, measuring and formatting results, registering to a file, using the table, graphical presentation of results.
7. Creation of the user panel.

Teaching methods

Lectures: lecture with a multimedia presentation supplemented with examples given on the blackboard, initiating discussions related to issues, referring to the curriculum content of other subjects;
Laboratory classes: individual or team work, discussion of various methods and aspects of problem solving. Detailed review of the documentation from the laboratory by the teacher.

Bibliography

Basic:
• Nawrocki W., Komputerowe systemy pomiarowe, WKŁ, 2007;
• Winiecki W., Organizacja komputerowych systemów pomiarowych, Oficyna Wydawnicza Politechniki Warszawskiej, 2006;
• Tumański S., Technika pomiarowa, Wydawnictwo WNT, 2013;
• Krawiecki Z., Odon A.: Wspomagane komputerowo stanowisko laboratoryjne do badania właściwości metrologicznych multimetrów na zakresach napieć przemiennych, Pomiary Automatyka Kontrola, 2007, vol. 53, nr 9 bis, s. 710-712.

Additional:
• Nawrocki R., Rozproszone systemy pomiarowe, WKŁ, 2006;
• Lesiak P., D. Swisulski D., Komputerowa technika pomiarowa w przykładach, Agenda Wydawnicza PAK, 2002.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00