COURSE DESCRIPTION CARD - SYLLABUS

Course name
Design of Measurement Systems [S1EiT1E>PSP]

Course

Field of study
Electronics and Telecommunications

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
english

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

1. Students have a knowledge in metrology and algprithms. 2. He has a basic, systematic knowledge of programming and operating systems 3. Student has a basic knowledge of telecommunications and EMG waves..

Course objective

Acquiring knowledge and skills in the field of configuring measuring and monitoring systems as well as their programming using programming languages and programming environments.

Course-related learning outcomes

Knowledge:
1. Student has a systematic knowledge, together with necessary mathematical background, of the fundamentals of metrology, which is necessary to measure the signal properties and the parameters of electronic and telecommunication systems components. Has knowledge of measurement methods, measurement equipment.
2. Student knows the components of the computer measuring system and its possible configurations. Knows what are the interface functions in the measuring interface standard and understands their

meaning.
3. The student knows the basic measuring interfaces (IEEE-488, VXI, PXI) and general interfaces used in measuring systems: USB, WiFi, GSM / LTE.
4. Student knows the basic programming languages and widely used graphic programming environments of measurement systems, in particular LabVIEW, NI SignalExpress and VEE. The student knows the basic functions and instructions used in these languages.
5. Student has basic knowledge about graphical programming.
6. Student knows the concept of virtual measuring system and its properties. Knows the advantages and limitations of a virtual measuring instrument.
7. Student knows the economic conditions associated with the construction and operation of the measuring system and in particular the relationship between the metrological parameters of the system, hardware (hardware), software and the costs of building the system and operating costs.
8. Student has knowledge in the field of configuring measuring and monitoring systems as well as their programming using programming languages and programming environments.

Skills:
1. Student can choose the right system configuration suitable for the measurement task.
2. He can determine the type of transmission (serial or parallel; wired or wireless) in the computer measuring system, the necessary transmission speed and the type of interface standard suitable for the measuring task.
3. Student is able to design a computer measuring system and develop an algorithm for its operation, including the implementation of this algorithm in working on the measurement system software. Student is able to develop a software for a measuring system in Visual Basic or C++ , or in the NI SignalExpress environment, or LabVIEW (LabVIEW 2018 version and newer), or VEE.
4. Student is able to create an ergonomic graphical user interface (graphic panel of the measuring system)
5. He can plan a measurement experiment.
6. He is able to use appropriate methods to ensure the correctness and safety of the measurement system.
7 He can create a softwate for controlling a computer measuring system in the programming language LabVIEW and VEE. Can create an ergonomic graphic user interface.
8. He is able to set up and run a computer measuring system and a virtual measuring instrument with a selected DAQ board.

Social competences:
1. Demonstrates responsibility and professionalism in solving technical problems.
2. Demonstrates responsibility for designed electronic and telecommunication systems. Is aware of the hazards they pose for individuals and communities if they are improperly designed or produced.
3. Is aware of the main challenges facing electronics and telecommunication in the 21st century.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
evaluation of student preparation for experiments, acceptance of students reports

Programme content

• Technical assumptions for the designed system
• Structure of measuring systems.
• Interface functions in measuring systems. Software algorithms for measuring systems Programming languages and environments.
• LabVIEW 2018 development environment and NI SignalExpress - National Instruments.
• Functions (All Functions palette) and control instructions (All Controls palette) in the environment and LabVIEW input and output support. Creating subprograms VI (virtual instrument).
• Software creation of measurement systems in a programming environment - from algorithm to software.
• Creating a graphical user interface (front panel on the computer monitor).
• Stages of starting the program.
• Computer DAQ boards and virtual measuring instruments.

• Virtual measuring system software.
• VEE (Agilent) and TestPoint (Keithley) development environments.

Teaching methods

lectures, laboratory experiments, consultations, individual study

Bibliography

Basic
1. Computer-Based Measurement Systems, Nawrocki W., skrypt w formie maszynopisu wydany przez PP w ramach programu "Inżynier przyszlości" i finansowany przez Unie Europejska, Poznań, 2017.
2. Measurement Systems and Sensors, Nawrocki W., Artech House, London-Boston, wyd. 2, 2015.
3. Practical Data Acquisition for Instrumentation and Control Systems, Park J., Mackey S. Elsevier, 2003.
4 .Komputerowe systemy pomiarowe. Ćwiczenia laboratoryjne, Praca zbiorowa, Wyd. PP, Poznań, 2007.
5. Środowisko LabVIEW w eksperymencie wspomaganym komputerowo, Tłaczała W., Wyd. Naukowo-Techniczne, Warszawa, 2017.
3.Komputerowe systemy pomiarowe. Ćwiczenia laboratoryjne, Praca zbiorowa, Wyd. PP, Poznań, 2007.
Additional
1. LabVIEW w praktyce, Chruściel M., Wydawnictwo BTC, 2008.

Breakdown of average student's workload

	Hours	ECTS
Total workload	0	0,00
Classes requiring direct contact with the teacher	0	0,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	0	0,00