# COURSE DESCRIPTION CARD - SYLLABUS

Course name

Measurement Systems in Electric Power Engineering

## Course

Field of study

Electrical Engineering

Year/Semester

2/3

Area of study (specialization)

High Voltage Engineering

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

elective

## Number of hours

Lecture

0

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

## Number of credit points

2

## Lecturers

Responsible for the course/lecturer:

Wojciech Sikorski, Ph. D., Eng.

Faculty of Environmental Engineering and Energy

Institute of Electric Power Engineering

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tel. 61 665 2035

Responsible for the course/lecturer:

## Prerequisites

The student has knowledge of mathematics and numerical methods. They have knowledge of the basics of programming. The student has knowledge of the construction and operation of measuring equipment and measuring techniques used in the power industry. The student is able to choose the measurement technique to determine the diagnostic parameters of electric power circuits and devices.

## Course objective

Understanding the methods of designing the software layer of diagnostic systems used in the electrical power industry. Getting to know the methods of acquisition and digital processing of measurement

signals recorded by transducers, controllers, and sensors used in the electrical power industry. Getting to know the interfaces and communication protocols used in automatic measurement systems.

## Course-related learning outcomes

Knowledge

1. The student has knowledge of the design and programming of diagnostic systems used to test electrical power devices.

2. The student has knowledge of digital processing of measurement signals.

Skills

1. The student is able to select and integrate the elements of a specialized measurement and control system, including central unit, measuring sensors, controllers, peripherals and communication modules, and signal acquisition modules.

2. The student is able to design and create software for the control and measurement system for the needs of a given diagnostic method.

3. The student is able to implement and apply selected methods of digital processing of measurement signals.

4. The student is able to cooperate with the project team.

Social competences

1. The student is ready to act as a responsible designer of measurement systems used in the electrical power industry.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. Continuous assessment in class - rewarding activity.

2. Colloquium conducted at the end of the semester.

## Programme content

1. Tools for designing control and measurement systems: LabVIEW programming environment (National Instruments), graphical programming language G, virtual measuring instruments, data structures and control structures (loops, arrays, conditional structures, management of the sequence of operations, event control, semaphores, subroutines), graphical user interface, measurement data visualization.

2. Programming with the use of cards and measuring devices (measurement and generation of analog signals), the configuration of signal acquisition threads (acquisition of a finite sequence of samples, continuous acquisition, acquisition of a single sample).

3. Programming of control and measurement applications with the use of embedded systems and microcontrollers.

## Teaching methods

Laboratory: solving tasks, practical exercises, teamwork.

## Bibliography

Basic

1. Chruściel M., LabVIEW w praktyce, Wydawnictwo BTC, 2014.

2. Maj P., Wirtualne systemy kontrolno-pomiarowe, Wydawnictwa AGH, 2011.

3. Bień A., Systemy pomiarowe w elektroenergetyce, Wydawnictwa AGH, 2013.

4. Świsulski D., Komputerowa technika pomiarowa. Oprogramowanie wirtualnych przyrządów pomiarowych w LabVIEW, Agenda Wydawnicza PAK, 2005.

5. Świsulski D., Przykłady cyfrowego przetwarzania sygnałów w LabVIEW, Wydawnictwo Politechniki Gdańskiej, 2012.

Additional

1. LabVIEW Getting Started with LabVIEW, National Instruments, 2013.

2. LabVIEW Fundamentals, National Instruments, 2005.

3. LabVIEW Data Acquisition Basics Manual, National Instruments, 2000.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 55 | 2,0 |
| Classes requiring direct contact with the teacher | 30 | 1,0 |
| Student's own work (literature studies, preparation for test)[1] | 25 | 1,0 |

[1] delete or add other activities as appropriate