COURSE DESCRIPTION CARD - SYLLABUS

Course name
Metrology and measuring systems [N1Energ2>MiSP]

Course

Field of study
Power Engineering

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
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
10

Other
0

Tutorials
0

Projects/seminars
10

Number of credit points

4,00

Coordinators

dr hab. inż. Grzegorz Wiczyński prof. PP
grzegorz.wiczynski@put.poznan.pl

Lecturers

Prerequisites

Basic knowledge of mathematics, physics, electrical engineering. Ability to perform measurements of basic electrical quantities. Ability to properly interpret the results of measurements and calculations. Awarness of the need to expand their competences and is ready to cooperate as part of a team.

Course objective

Knowledge of the measurement techniques, properties of modern measuring equipments, the principles of using analog and digital instruments and the fundamentals of measurement results evaluation.

Course-related learning outcomes

Knowledge:
1. Understanding the basic physical phenomena occurring in electrical, power energy and electronic components and systems and in their surroundings.
2. Knowledge in the field of theory of electrical and electronic circuits and in the field of signal theory and methods of their processing.
3. Knowledge and understanding the methods of measuring basic quantities characterizing devices and electrical systems of different kinds.

Skills:
1. Ability to use properly selected methods and devices enabling measurement of basic quantities characterizing power elements and systems.
2. Ability to design simple power systems for various applications.
3. Ability to run and test a designed simple electrical system

Social competences:
1. Understanding the need and knowledge the possibilities of continuous training, raising professional competences, and is ready to critically assess knowledge, recognizes its importance in solving cognitive and practical problems.
2. Awarness of the responsibility for own work and readiness to comply with the principles of team work and to bear the responsibility of the professional role in jointly implemented tasks.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures
Evaluation of the knowledge with a written exam related to the content of lectures (test, computational and problem questions). Passing threshold of test equals 50%.
The grade from laboratory and project classes as well as attendance and activities during the lectures are taken into account.
Laboratory
Assessment of knowledge and skills necessary to carry out the laboratory exercise. Assessmeny of the activity and quality of perception during the laboratory exercise. Evaluation of the reports of the exercises performed. Final test in written (passing threshold 50%).
Project
Assessment of acquired skills on the basis of the prepared project of a simple electronic measurement system and on the basis of the prepared implementation of the digital measuring signal chain of the selected quantity determining the power quality.

Programme content

Measurement methodology. Planning and realization of a measurement task. An error and an uncertainty of measurement results. Measuring transducers. Cooperation between measuring transducers and devices. Methods of measurements. Measuring bridges. Analog and digital measurements of electrical quantities. Selected examples of measurements of nonelectrical quantities. Structure and organization of measurement systems. Measurements of electrical signals with analog oscilloscopes. Preparation of the results of measurements.

Course topics

Lectures
Measurement methodology: definition and basic terms. Planning and realization of a measurement task. Elements of errors theory and uncertainty of measurement results. Measuring transducer: processing characteristics, static and dynamic properties, linearity, supply. Cooperation between measuring transducers and devices - signal transmission, interaction. Measurements with oscilloscopes. Methods of measurements. Measuring bridges. Analog and digital measurements of electrical quantities. Selected examples of measurements of nonelectrical quantities. Introduction to structure and organization of measurement systems. Knowledge of safety principles during measurements. Planning and realization of measurements of the basic electrical quantities with widely available analog and digital equipment. Measurements of electrical signals with analog oscilloscopes. Preparation of the documentation based on the obtained results of measurements.
Laboratory
Measurement methodology: definitions, concepts, standards, units of measurement. Planning and implementation of the measurement task. Elements of error theory and uncertainty of measurement results. Measurement methods. Measuring transducers: AC voltage detectors, measuring amplifiers, A/D converters. Analog and digital measurements of electrical quantities. Oscilloscopic measurements. Examples of measurement of electrical quantities and the assesment of their results unaccuracy.
Project

Preparation of the project of simple measurement systems with the use of selected electronic components. Introduction to the normative requirements by the implementation of a digital measurement signal chain of the selected quantity determining the power quality.

Teaching methods

Lecture
Lectures are performed using multimedia presentations illustrated with simulation examples and necessary mathematical calculations on the blackboard. Theoretical questions are presented in the exact reference to the practice.
Laboratory
Laboratory exercises are carried out in laboratory teams. During the classes, the measuring system is connected, the selected measurements are carried out, the results of the measurements and the reports are prepared.
Project
Independent implementation of design tasks in selected programming environments with the support of the teacher.

Bibliography

Basic:
1. A. Chwaleba, M Poniński, A. Siedlecki, Metrologia elektryczna, WNT, Warszawa, 2009.
2. A. Cysewska-Sobusiak, Podstawy Metrologii i inżynierii pomiarowej, Wyd. Politechniki Poznańskiej, 2010.
3. J. Rydzewski, Pomiary oscyloskopowe, WNT, Warszawa, 2007.

Additional:
1. Międzynarodowy Słownik Podstawowych i Ogólnych Terminów Metrologii, Wydanie polskie, Główny Urząd Miar, Warszawa, 1996.
2. W. Winiecki, Organizacja komputerowych systemów pomiarowych, Ofic. Wyd. PW, Warszawa, 1997.
3. A. Zatorski, R. Sroka, Podstawy metrologii elektrycznej, Wyd. AGH, Kraków 2011.
4. S. Tumański, Technika pomiarowa, WNT 2007.

Breakdown of average student's workload

	Hours	ECTS
Total workload	110	4,00
Classes requiring direct contact with the teacher	40	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	70	2,50