COURSE DESCRIPTION CARD - SYLLABUS

Course name
Selected problems with evaluation of power quality

Course

Field of study
Electrical Engineering
Area of study (specialization)
Measurement Systems in Industry and Biomedical Engineering
Level of study
Second-cycle studies
Form of study
part-time

Year/Semester
2 / 4
Profile of study
general academic
Course offered in
polish
Requirements
compulsory

Number of hours

Lecture
10
Laboratory classes
0
Other (e.g. online)
0
Tutorials
0
Projects/seminars
10

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Prerequisites

Basic knowledge of electrical engineering, metrology and signal theory. Basic information on electronics. Ability to effectively self-study in a field related to the subject. Awarness of the need to expand their competences and is ready to cooperate as part of a team.

Course objective

Understanding selected current problems of assessing the power quality in power grids.

Course-related learning outcomes

Knowledge

1. Ability to determine the areas of application and scope of applications for modern measurement systems.

2. Ability to explain the principles and techniques of acquisition and processing of measurement signals for the needs of modern industrial applications and biomedical engineering.

Skills

Ability to creatively design modern measurement systems, using the possibilities offered by modern technologies, taking into account the limitations of the current level of knowledge and technology.

Social competences

1. Ability to think and act in an entrepreneurial manner in the field of modern measurement systems.

2. Understanding the need for wider dissemination of knowledge in the field of simple and complex measurement systems used in biomedical industry and engineering.

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 project as well as attendance and activities during the lectures are taken into account.

Project

Assessment of knowledge necessary to implement the problems posed in the area of project tasks. Assessment of skills related to the implementation of the measurement task. Evaluation of the prepared project.

Programme content

Lectures

Legal and standard bases for assessing the power quality in power grids. Frequency measurement of distorted signals . Measurement of harmonics, interharmonics and THD factor of periodic and nonperiodic signals. Description and measurement of voltage variation. Impact of active and reactive power variability on voltage variation. Flicker caused by voltage variation. Modeling of the flickermeter signal path. Examples of obnoxious loads.

Project

Legal and standard bases for assessing the power quality in power grids. Frequency measurement of distorted signals. Measurement of harmonics, interharmonics and THD factor of periodic and nonperiodic signals. Modeling of the flickermeter signal path.

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.

Project

Working in teams and perform project tasks.

The teaching methods used are student-oriented and motivate them to actively participate in the teaching process through discussions and papers.

Bibliography

Basic

1. Z. Kowalski, Jakość energii elektrycznej , Wyd. PŁ, Łódź, 2007.

2. Normy dotyczące kompatybilności elektromagnetycznej: PN-EN 50160, PN-EN 61000-4-30, PN-EN 61000-4-15, PN-EN 61000-4-7.

3. Rozporządzenie Ministra Gospodarki z 4 maja 2007 r. w sprawie szczegółowych warunków funkcjonowania systemu elektroenergetycznego. (Dz.U. Nr 93, poz. 623, z dnia 29 maja 2007 r.).

4. J. Szabatin, Podstawy teorii sygnałów, WKiŁ, Warszawa 2003.

5. Z. Kowalski, Wahania napięcia w układach elektroenergetycznych, WNT, Warszawa, 1985.

6. G. Wiczyński, Badanie wahań napięcia w sieciach elektrycznych, Wyd. PP, Poznań, 2010.

7. Z. Hanzelka, Jakość dostawy energii elektrycznej. Zaburzenia wartości skutecznej napięcia, Wyd. AGH, Kraków, 2013.

Additional

8. D. Zmarzły, Badania jakości energii w wybranej farmie wiatrowej, Wyd. PO, Opole, 2014.

9. T. Sikorski, Monitoring i ocena jakości energii w sieciach elektroenergetycznych z udziałem generacji rozproszonej, Wyd. PWr, Wrocław, 2013.

10. T. Tarasiuk, Ocena jakości energii elektrycznej w okrętowych systemach elektroenergetycznych z wykorzystaniem procesorów sygnałowych, Wyd. Akademii Morskiej, Gdynia, 2009.

11. P. Ruszel, Kompatybilność elektromagnetyczna elektronicznych urządzeń pomiarowych, Wyd. PWr, Wrocław, 2008.

12. K.L. Kaiser, Electromagnetic compatibility handbook, CRC Press, 2005.

13. A. Bień, Metrologia jakości energii elektrycznej w obszarze niskoczęstotliwościowych zaburzeń napięcia sieci, Wyd. AGH, Kraków, 2003.

14. R. Schaumann, Van Valkenburg, E. Mac, Design of analog filters, Oxford University Press, 2001.

15. www.electropedia.org

Breakdown of average student's workload

	Hours	ECTS
Total workload	65	2,0
Classes requiring direct contact with the teacher	27	1,0
Student's own work (literature studies, preparation for classes, preparation for tests, project preparation) [1]	38	1,0

[1] delete or add other activities as appropriate