STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Selected problems with evaluation of power quality	**1010325341010326096**

Field of study	Profile of study (general academic, practical)	Year /Semester
Electrical Engineering	**(brak)**	**2 / 4**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Measurement Systems in Industry and	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**part-time**

No. of hours	No. of credits
Lecture: **9** Classes: **-** Laboratory: **-** Project/seminars: **9**	**2**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**2 100%**
Technical sciences	**2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of electrotechnics, metrology, and signal theory. Basic knowledge in the scope of electronics.
2	**Skills**	Ability of the efficient self-education in the area concerning the module
3	**Social competencies**	Awareness of the necessity of competence broadening and ability to show readiness to work as a team

Assumptions and objectives of the course:

- Knowledge of the selected present problems with the evaluation of power quality in power grids.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Ability to describe the application areas and potential of the modern measurement systems - [K_W11 ++]
2. Ability to explain the principles and techniques of measurement signals acquisition and processing for the modern industrial and biomedical applications - [K_W11 ++, K_W12 +]

Skills:

1. Ability to design creatively the modern measurement systems, using the possibilities offered by presenty available technologies, taking into account the limitattions of the knowledge and technique status - [K_U01 +, K_U09 +, K_U15 +]

Social competencies:

1. Ability to think and act enterprisingly in the area of the modern measurement systems - [K_K01 +]
2. Understanding a need of the broad populatrization of the knowledge in the area of simple and complex measurement systems used in industry and biomedical engineering - [K_K02 +]

Assessment methods of study outcomes

Lectures:

- evaluation of the knowledge related to the content of lectures (test, computational and problem questions),
- continuous estimation in all classes (awarding attendance in lectures, activity and quality of perception).

Projects:

- continuous evaluation, at all classes,and awarding the skill increase in the use of the known principles and methods,
- evaluation of the knowledge and skills related to a given group or independent project and evaluation of the prepared reports.

Course description

Updating 2017:

Methods of education are orientated to students to motivate them to participate actively in education process by discussion and reports.

Lectures:

Multimedia presentations expanded by examples shown on a board. Activity of students is taken into consideration in final students evaluation. Theoretical questions are presented in the exact reference to the practice.

Projects:

Groups of students work as teams. Discussion on different methods and aspects of problem solutions. Detailed reviewing of particular projects documentation with:

- Legal and standard status of evaluation of power quality in power grid.
- Measurements of frequency of the deformed signals .
- Measurements of the harmonics, interharmonics and distortion factor of periodical and non-periodical signals.
- Measures of voltage fluctuations.
- Influence of changes in the active and reactive powers on voltage fluctuations.
- Light flickering to be caused by voltage variation.
- Modeling of the flickermeter signal line.
- Examples of noxious loads.

Basic bibliography:

1. S. Bolkowski, Elektrotechnika, Wyd. Szkolne i Pedagogiczne, Warszawa 2009.
2. J. Mindykowski, Ocena jakości energii elektrycznej w systemach okrętowych z układami przekształtnikowymi, Okrętownictwo i Żegluga, Gdańsk 2001.
3. J. Szabatin, Podstawy teorii sygnałów, wyd. 3, WKŁ, Warszawa 2000.
4. G. Wiczyński, Badanie wahań napięcia w sieciach elektrycznych, Seria Rozprawy, nr 438, Wyd. Politechniki Poznańskiej, Poznań 2010.
5. Dokument harmonizacyjny HD 60027-1:2004, CENELEC 2004.

Additional bibliography:

1. Z. Kowalski, Wahania napięcia w układach elektroenergetycznych, WNT, Warszawa 1985.
2. Z. Kowalski, Cechy i parametry jakościowe energii elektrycznej, WNT, Warszawa 1995.
3. Z. Kowalski, Jakość energii elektrycznej, WPŁ, Łódź 2007.
4. Aktualne Rozporządzenie Ministra Gospodarki w sprawie szczegółowych warunków przyłączenia podmiotów do sieci elektroenergetycznych, ruchu i eksploatacji tych sieci.
5. Normy dotyczące kompatybilności elektromagnetycznej: PN-EN 50160, PN-EN 61000-4-30, PN-EN 61000-4-15, PN-EN 61000-4-7.

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	9
2. Participation in projects classes	9
3. Participation in consulting with the lecturer	5
4. Realization of projects	18
5. Preparation to the credit	12

Student's workload

Source of workload	hours	ECTS

Total workload	53	2
Contact hours	25	1
Practical activities	27	1