

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Selected problems with evaluation of power quality		Code 1010325341010326096
Field of study Electrical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 2 / 4
Elective path/specialty Measurement Systems in Industry and	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) part-time	
No. of hours Lecture: 9 Classes: - Laboratory: - Project/seminars: 9		No. of credits 2
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 2 100% 2 100%
Responsible for subject / lecturer: dr inż. Przemysław Otomański email: przemyslaw.otomanski@put.poznan.pl tel. 616652599 Wydział Elektryczny ul. Piotrowo 3A 60-965 Poznań		
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 presently available technologies, taking into account the limitations 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 popularization 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		

<p>Lectures:</p> <ul style="list-style-type: none"> - 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). <p>Projects:</p> <ul style="list-style-type: none"> - 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		
<ul style="list-style-type: none"> - 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:		
<ol style="list-style-type: none"> 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:		
<ol style="list-style-type: none"> 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, WPL, 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