

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Selected problems with evaluation of power quality</b>		Code <b>1010322331010326096</b>
Field of study <b>Electrical Engineering</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>2 / 3</b>
Elective path/specialty <b>Measurement Systems in Industry and</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>Second-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>15</b> Classes: <b>-</b> Laboratory: <b>-</b> Project/seminars: <b>15</b>		No. of credits <b>3</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art <b>technical sciences</b> <b>Technical sciences</b>		ECTS distribution (number and %) <b>3 100%</b> <b>3 100%</b>
<b>Responsible for subject / lecturer:</b>  dr hab. inż. Grzegorz Wiczyński email: grzegorz.wiczyński@put.poznan.pl tel. 616652639 Wydział Elektryczny ul. Piotrowo 3A 60-965 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	Basic knowledge of electrotechnics, metrology, and signal theory. Basic knowledge in the scope of electronics.
2	<b>Skills</b>	Ability of the efficient self-education in the area concerning the module
3	<b>Social competencies</b>	Awareness of the necessity of competence broadening and ability to show readiness to work as a team
<b>Assumptions and objectives of the course:</b> - Knowledge of the selected present problems with the evaluation of power quality in power grids.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
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 +]		
<b>Skills:</b>		
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 +]		
<b>Social competencies:</b>		
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 +]		
<b>Assessment methods of study outcomes</b>		

<p>Lectures:</p> <ul style="list-style-type: none"> <li>- evaluation of the knowledge related to the content of lectures (test, computational and problem questions),</li> <li>- continuous estimation in all classes (awarding attendance in lectures, activity and quality of perception).</li> </ul> <p>Projects:</p> <ul style="list-style-type: none"> <li>- continuous evaluation, at all classes, and awarding the skill increase in the use of the known principles and methods,</li> <li>- evaluation of the knowledge and skills related to a given group or independent project and evaluation of the prepared reports.</li> </ul>		
<b>Course description</b>		
<p>Updating 2017:</p> <p>Methods of education are orientated to students to motivate them to participate actively in education process by discussion and reports.</p> <p>Lectures:</p> <p>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.</p> <p>Projects:</p> <p>Groups of students work as teams. Discussion on different methods and aspects of problem solutions. Detailed reviewing of particular projects documentation with:</p> <ul style="list-style-type: none"> <li>- Legal and standard status of evaluation of power quality in power grid.</li> <li>- Measurements of frequency of the deformed signals .</li> <li>- Measurements of the harmonics, interharmonics and distortion factor of periodical and non-periodical signals.</li> <li>- Measures of voltage fluctuations.</li> <li>- Influence of changes in the active and reactive powers on voltage fluctuations.</li> <li>- Light flickering to be caused by voltage variation.</li> <li>- Modeling of the flickermeter signal line.</li> <li>- Examples of noxious loads.</li> </ul>		
<p><b>Basic bibliography:</b></p> <ol style="list-style-type: none"> <li>1. S. Bolkowski, Elektrotechnika, Wyd. Szkolne i Pedagogiczne, Warszawa 2009.</li> <li>2. J. Mindykowski, Ocena jakości energii elektrycznej w systemach okrętowych z układami przekształtnikowymi, Okrętownictwo i Żegluga, Gdańsk 2001.</li> <li>3. J. Szabatin, Podstawy teorii sygnałów, wyd. 3, WKŁ, Warszawa 2000.</li> <li>4. G. Wiczyński, Badanie wahań napięcia w sieciach elektrycznych, Seria Rozprawy, nr 438, Wyd. Politechniki Poznańskiej, Poznań 2010.</li> <li>5. Dokument harmonizacyjny HD 60027-1:2004, CENELEC 2004.</li> </ol>		
<p><b>Additional bibliography:</b></p> <ol style="list-style-type: none"> <li>1. Z. Kowalski, Wahania napięcia w układach elektroenergetycznych, WNT, Warszawa 1985.</li> <li>2. Z. Kowalski, Cechy i parametry jakościowe energii elektrycznej, WNT, Warszawa 1995.</li> <li>3. Z. Kowalski, Jakość energii elektrycznej, WPL, Łódź 2007.</li> <li>4. Aktualne Rozporządzenie Ministra Gospodarki w sprawie szczegółowych warunków przyłączenia podmiotów do sieci elektroenergetycznych, ruchu i eksploatacji tych sieci.</li> <li>5. Normy dotyczące kompatybilności elektromagnetycznej: PN-EN 50160, PN-EN 61000-4-30, PN-EN 61000-4-15, PN-EN 61000-4-7.</li> </ol>		
<b>Result of average student's workload</b>		
<b>Activity</b>		<b>Time (working hours)</b>
1. Participation in lectures		15
2. Participation in projects classes		15
3. Participation in consulting with the lecturer		18
4. Realization of projects		20
5. Preparation to the credit		12
<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>

Total workload	80	3
Contact hours	48	2
Practical activities	35	1