

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Metrology and measuring systems		Code 1010312421010325637
Field of study Power Engineering	Profile of study (general academic, practical) general academic	Year /Semester 1 / 2
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 15 Classes: - Laboratory: 15 Project/seminars: -		No. of credits 2
Status of the course in the study program (Basic, major, other) other		(university-wide, from another field) university-wide
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 hab. inż. Andrzej Odon email: andrzej.odon@put.poznan.pl tel. 61 665 2599 Elektryczny ul. Piotrowo 3a, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge in the scope of metrology, mathematics, physics and electrotechnics
2	Skills	Ability of the efficient self-education in the area of the chosen field of studies
3	Social competencies	Awareness of the necessity of competence broadening, ability to show readiness to work as a team
Assumptions and objectives of the course: - Knowledge of the measurement methodology, principles of Zapoznanie się z metodyką pomiarów, zasadami eksploatacji przyrządów analogowych i cyfrowych oraz opracowywania wyników pomiarów. - Knowledge of the principles of construction, design and applications of measurement systems.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Ability to describe the basic methods of signal processing used in electrical metrology and in modern measurement systems, especially concerned the evaluation of inaccuracy of results - [K_W05 +++] 2. Ability to indicate the basic principles of electrical quantities measurements made with analog and digital devices - [K_W05 ++]		
Skills:		
1. Ability to evaluate the usefulness of methods and tools used in measurements, diagnostics and support of decisions connected with energy processes - [K_W09 ++] 2. Ability to plan and make a simple measurement task with a measurement system - [K_W03 +]		
Social competencies:		
1. Ability to think and act in the enterprising and responsible way in the area of measurement engineering - [K_K01 ++]		
Assessment methods of study outcomes		

<p>Lectures:</p> <ul style="list-style-type: none"> - evaluation of the knowledge with a written exam related to the content of lectures (test, computational and problem questions), awarding marks in laboratory exercises) - continuous estimation in all classes (awarding attendance in lectures, activity and quality of perception). <p>Laboratory exercises:</p> <ul style="list-style-type: none"> - continuous estimating with the tests, - awarding the skill increase, - the evaluation of knowledge and skills connected with the measuring tasks and prepared reports <p>Getting additional points for the activity during classes, in particular:</p> <ul style="list-style-type: none"> - the efficiency of the use of acquired knowledge to solve a given problem; - skill of the co-operation within the team practically realizing a given detailed task in the laboratory; - remarks connected with the improvement of didactic materials; - the aesthetic qualities of the reports 	
Course description	
<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>Laboratory:</p> <p>Detailed reviewing of particular exercises reports. Realization of laboratory tasks in teams, taking into account the specific computational experiments covering:</p> <ul style="list-style-type: none"> - Inaccuracy and uncertainty of measurement results in direct and indirect measurements. - Static and dynamic properties of instruments and measuring tools. - Measuring transducers: alternating voltage detectors, measuring amplifiers, a/c and c/a converters. - Operation of analog and digital measuring devices. - Advanced techniques of recording and visualization of the time course of signals. electrical - digital oscilloscope, digital recorder. - Examples of configuration of measuring systems. 	
<p>Basic bibliography:</p> <ol style="list-style-type: none"> 1. 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. Grzelka, E. Mazur, M. Gruca, W. Tutak, Miernictwo i systemy pomiarowe - laboratorium, WPC, Częstochowa, 2004. 4. W. Nawrocki, Rozproszone systemy pomiarowe, WKiŁ, Warszawa, 2006 5. J. Rydzewski, Pomiary oscyloskopowe, WNT, Warszawa, 6. S. Tumański, Technika pomiarowa, WNT 2007 	
<p>Additional bibliography:</p> <ol style="list-style-type: none"> 1. A. Zatorski, R. Sroka, Podstawy metrologii elektrycznej, Wyd. AGH, Kraków 2011 	
Result of average student's workload	
Activity	Time (working hours)
1. Participation in lectures	15
2. Participation in laboratory exercises	15
3. Participation in consulting with the teachers	6
4. Preparation to laboratory exercises and preparation of reports	11
5. Preparation to exam	10
6. Participation in exam	3
Student's workload	

Source of workload	hours	ECTS
Total workload	60	2
Contact hours	39	1
Practical activities	30	1