

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Metrology and measuring systems		Code 1010315421010325637
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) part-time	
No. of hours Lecture: 8 Classes: - Laboratory: 8 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 in direct and indirect measurements. - Static and dynamic properties of measuring devices and equipment. - Measuring transducers: detectors of alternating voltage, measuring amplifiers, a/c and c/a convertors. - Application of analog and digital measurement devices. - Advanced techniques of recording and visualization of the time course of signals - digital oscilloscope, digital recorder - Examples of configuration of the measurement systems. 		
<p>Basic bibliography:</p> <ol style="list-style-type: none"> 1. A. Chwaleba, M Poniński, A. Siedlecki, Metrologia elektryczna, WNT, Warszawa, 2010. 2. A. Cysewska-Sobusiak, Podstawy Metrologii i inżynierii pomiarowej, Wyd. Politechniki Poznańskiej, 2010. 3. W. Nawrocki, Rozproszone systemy pomiarowe, WKiŁ, Warszawa, 2006. 4. J. Rydzewski, Pomiary oscyloskopowe, WNT, Warszawa, 2007 . 5. 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	8	
2. Participation in laboratory exercises	8	
3. Participation in consulting with the teachers	4	
4. Preparation to laboratory exercises and preparation of reports	8	
5. Preparation to exam	8	
6. Participation in exam	2	
Student's workload		
Source of workload	hours	ECTS

Total workload	38	2
Contact hours	22	1
Practical activities	8	1