

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Electronic converters of signals</b>		Code <b>1010324381010321573</b>
Field of study <b>Electrical Engineering</b>	Profile of study (general academic, practical) <b>general academic</b>	Year /Semester <b>4 / 8</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>First-cycle studies</b>	Form of study (full-time, part-time) <b>part-time</b>	
No. of hours Lecture: <b>9</b> Classes: <b>-</b> Laboratory: <b>18</b> Project/seminars: <b>-</b>		No. of credits <b>3</b>
Status of the course in the study program (Basic, major, other) <b>other</b>		(university-wide, from another field) <b>university-wide</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. Andrzej Odon email: andrzej.odon@put.poznan.pl tel. 616652599 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 algebra, mathematical analysis, physics, electrical engineering, electronics, computer science, and metrology Basic knowledge in the scope of electronic analog circuits and digital techniques
2	<b>Skills</b>	Ability of the efficient self-education in the area concerned with electronic processors of signals
3	<b>Social competencies</b>	Awareness of the necessity of broadening of the competencies in the field of electrical engineering and willingness to cooperate in a team
<b>Assumptions and objectives of the course:</b> - Knowledge of characteristics and applications of analog, analog-to-digital and digital-to-analog converters. - Knowledge in the scope of modern techniques of measuring data processing		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b> 1. Ability to explain the principles and techniques of measuring signals acquisition for applications in industry and biomedical engineering - [K_W03 +] 2. Ability to describe the importance and the application possibilities of present measuring systems - [K_W14 ++]		
<b>Skills:</b> 1. Ability to design measuring systems creatively, using possibilities offered by new technologies, taking into account limitations of current actual status of knowledge and technique - [K_U03 ++, K_U22 +] 2. Ability to work independently and as a team in design and construction companies - [K_U05 +]		
<b>Social competencies:</b> 1. Ability think and act enterprisingly in the area of measuring systems to be used in industry and biomedical engineering - [K_K01 +] 2. Understanding the need of broad popularization of the knowledge concerned the area of simple and complex measuring systems - [K_K05 +]		
<b>Assessment methods of study outcomes</b>		

<p>Lectures:</p> <ul style="list-style-type: none"> <li>- evaluation of the knowledge with an exam related to the content of lectures (test, computational and problem questions), awarding marks in laboratory exercises)</li> <li>- continuous estimation in all classes (awarding attendance in lectures, activity and quality of perception).</li> </ul> <p>Laboratory exercises:</p> <ul style="list-style-type: none"> <li>- continuous estimating with the tests,</li> <li>- awarding the skill increase,</li> <li>- the evaluation of knowledge and skills connected with the measuring tasks and prepared reports</li> </ul>		
<b>Course description</b>		
<p>Updating 2017:          Methods of education are orientated to students to motivate them to participate actively in education process by discussion and reports.</p> <p>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.</p> <p>Laboratory:          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"> <li>- Analog converters of electrical signals: operational amplifiers to be used as V/V, I/U, U/I converters; detectors of voltage peak and RMS values; sample-and-hold converters.</li> <li>- Digital-to-analog converters: parameters, functional components, converters with reference voltage source, converters with current switch over.</li> <li>- Analog-to-digital converters of voltage: parameters, functional components, errors of processing, different means of processing: double-integration, compensating, flash, sigma-delta, and other.</li> <li>- Experimental studies of selected types of electronic converters of signals.</li> </ul>		
<p><b>Basic bibliography:</b></p> <ol style="list-style-type: none"> <li>1. Z. Kulka, A. Libura, M. Nadachowski, Przetworniki analogowo-cyfrowe i cyfrowo-analogowe, WKŁ, Warszawa 1987</li> <li>2. U. Tietze, Ch. Schenk, Układy półprzewodnikowe, WNT, Warszawa 2001</li> <li>3. J. Zakrzewski, Czujniki i przetworniki pomiarowe, Wyd. Politechniki Śląskiej, Gliwice 2004</li> </ol>		
<p><b>Additional bibliography:</b></p> <ol style="list-style-type: none"> <li>1. J. Jakubiec, J. Roj, Pomiarowe przetwarzanie próbkujące, Wyd. Politechniki Śląskiej, Gliwice 2000</li> <li>2. Denton J. Dailey, Electronic Devices and Circuits, copyright 2001 by Prentice-Hall, Inc., Upper Sadle River, New Jersey 07548, USA. Warszawa 2002.</li> </ol>		
<b>Result of average student's workload</b>		
<b>Activity</b>	<b>Time (working hours)</b>	
1. Participation in lectures	9	
2. Participation in laboratory classes	18	
3. Participation in consulting with the lecturers	3	
4. Preparation to laboratory exercises and preparation of the reports	15	
5. Preparation to the exam	10	
<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	55	3
Contact hours	3	1
Practical activities	33	2