

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Measurements and analisys of biological signals		Code 1010321361010324819
Field of study Electrical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 6
Elective path/specialty Measurement Systems in Industry and	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: - Classes: - Laboratory: 30 Project/seminars: -		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		ECTS distribution (number and %)
Responsible for subject / lecturer: dr inż. Michał Boltrukiewicz email: michal.boltrukiewicz@put.poznan.pl tel. 61 665 61 665 2032 Elektryczny ul. Piotrowo 3a, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge in the scope of algebra, mathematical analysis, electronic analog circuits, digital technique, and digital processing of signals
2	Skills	Ability of the efficient self-education in the area concerned with the chosen field and speciality of studies
3	Social competencies	Awareness of the necessity of broadening of the competence in the field of electrical engineering and willingness to cooperate in a team
Assumptions and objectives of the course: Knowledge of modern methods of the measurements, processing and analysis of biological signals		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Ability to explain the principles and techniques of measuring signals acquisition for biomesurements - [K_W05+, K_W14 +]		
Skills:		
1. Ability to work independently and as a team in laboratories, research centres, and medical facilities - [K_U05 ++, K_U09 +, K_U23 +]		
Social competencies:		
1. Ability to think and act enterprisingly in the area of biomedical engineering - [K_K04 +, K_K05 +]		
Assessment methods of study outcomes		
- Tests and awarding the increase in knowledge necessary to realize the laboratory tasks, - Continuous estimation during all classes and awarding the increase in skills of using the get principles and methods, - The evaluation of knowledge and skills connected with the measuring tasks and prepared reports		
Course description		

<ul style="list-style-type: none"> - Analog conditioners of signals. - Cooperation of operational amplifiers with measuring sensors. - Kinds and specificity of biological signals. - Examples of noninvasive techniques of biomedical signals acquisition. - Sampling of measuring signals. - Aliasing and choice of the proper filter. - Comparison of analog and digital filters properties. - Basic mathematical operations using the collected samples of biosignals. - Digital Fourier Transform and fundamentals of spectrum analysis. - Selected problems concerned with Laplace transform and introduction to NOI digital filters. - Selected questions of the statistical methods of measuring data analysis. 		
<p>Basic bibliography:</p> <ol style="list-style-type: none"> 1. J.T. Białasiewicz, Falki i aproksymacje, WNT, Warszawa 2000 2. Biocybernetyka i inżynieria biomedyczna, red. M. Nałęcz, Akademicka Oficyna Wyd. EXIT, Warszawa 2001-2002 3. U. Tietze, Ch. Schenk, Układy półprzewodnikowe, WNT, Warszawa 2001 4. T. Zieliński, Cyfrowe przetwarzanie sygnałów. Od teorii do zastosowań, WKŁ, Warszawa 2007 		
<p>Additional bibliography:</p> <ol style="list-style-type: none"> 1. J. Jakubiec, J. Roj, Pomiarowe przetwarzanie próbkujące, Wyd. Politechniki Śląskiej, Gliwice 2000 2. J. Moczko, L. Kramer, Cyfrowe metody przetwarzania sygnałów biomedycznych, Wyd. UAM, Poznań 2001 3. J. Szabatin, Teoria sygnałów, WKŁ, Warszawa 2000 		
<p>Result of average student's workload</p>		
<p>Activity</p>		<p>Time (working hours)</p>
1. Participation in laboratory exercises		30
2. Participation in consulting with the lecturer		9
3. Preparation to laboratory exercises and preparation of the reports		20
<p>Student's workload</p>		
<p>Source of workload</p>	<p>hours</p>	<p>ECTS</p>
Total workload	59	2
Contact hours	39	1
Practical activities	50	2