

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Elements of Control Engineering		Code 1010101261010510286
Field of study Environmental Engineering First-cycle Studies	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 6
Elective path/specialty -	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: 30 Classes: - Laboratory: 15 Project/seminars: -		No. of credits 3
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 technical sciences		ECTS distribution (number and %) 3 100%
Responsible for subject / lecturer: dr hab. inż. Andrzej Urbaniak email: -andrzej.urbania@cs.put.poznan.pl tel. -61 665 2905 Wydział Informatyki ul. Piotrowo 3, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of mathematics, physics and electrical engineering
2	Skills	Skill of effective utilization knowledge from mathematical analysis and physics
3	Social competencies	Necessity of continuously actualization and verification knowledge
Assumptions and objectives of the course: -The transfer knowledge to students about control theory as a system discipline. Development skills concerning with dynamic objects and systems characteristics. The quality analysis of control system. Description of main control elements: sensors and controllers. Underline of new directions in control systems.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student knows basic terms utilized in control theory and control engineering - [K_W02] 2. Student knows description principles and desining od simply swiching systems - [K_W02,K_W07] 3. Student know the fundamentals mathematical description of dynamic objects and processes in environemtal engineering - [K_W02,K_W07] 4. Student knows the rules of automatic control and evaluation quality criteria of control - [K_W02,K_W07] 5. Student understands the working of controllers and typical sensors - [K_W07] 6. Student knows basic of computer control systems - [K_W07]		
Skills:		
1. Student skills to design simply control system utilizing logical elements, - [K_U15] 2. Student describes objects and processes using dynamic and frequency characteristics , - [K_U09] 3. Student skills to evaluate the stability of linear control system - [K_U10] 4. Student explanates action of typical sensors: temperature, level, preasure and flow - [K_U09]		
Social competencies:		
1. Student understands necessity team working for solution of theoretical and practical problems - [K_K03, K_K04] 2. Student docenia the importance of cooperation with technologists, computer and control engineers for effective application of new technology kresie automatyzacji - [K_K07] 3. Student understands neccessity systematic knowledege and skills expansion - [K_K01]		

Assessment methods of study outcomes		
Lecture: written test of knowledge Laboratory exercises: activity of exercises realization, evaluation of preparation to the problem solving, written exercises protocols		
Course description		
Basic terms of control and control engineering systems. Basic of swiching systems. Description of logical systems using Boole algebra. Minimization of swiching functions. Desining of liginal systems using NAND and NOR elements. Examples pf simply logical system desing. Linear control systems. Description of objects? dynamic with examples. Transfer function. Linearization of nonlinear characteristics. Identification of dynamic characteristics. Frequency response methods. Basic characteristics of objects: transfer function, jump function, amplitude-phase characteristic, examples and notation on the schema. Stability and quality of control systems. Blocks schema and its transformations. Classic governors: P, PI, PD, PID. Rules of controllers and parameters choice. Sensors and measurements converters of nonelectric magnitudes ? chosen examples, intelligent sensors. Nonlinear control systems. Introduction to computer control systems ? hardware and functional structure. Example of solutions.		
Basic bibliography:		
1. Urbaniak A., Podstawy automatyki, Wyd. PP, Poznań 2007 (wyd. III) 2. Dorf R.C., Bishop R.H., Modern control systems, Addison Wesley, 1995		
Additional bibliography:		
1. Findiesen W., Technika regulacji automatycznej, WNT, Warszawa 2006 r. 2. Klimasara W.J., Piłat Z., Podstawy automatyki i robotyki, WSiP, Warszawa 2006r.		
Result of average student's workload		
Activity	Time (working hours)	
1. Participation in lectures	30	
2. Participation in the laboratory exercises	15	
3. Preparation to laboratory exercises and its reporting	25	
4. Preparation to exam	20	
Student's workload		
Source of workload	hours	ECTS
Total workload	90	3
Contact hours	45	2
Practical activities	15	1