

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Programmable and Digital Controllers		Code 1010331261010332693
Field of study Automatic Control and Robotics	Profile of study (general academic, practical) general academic	Year /Semester 3 / 6
Elective path/specialty Automatic Control	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: 45 Classes: - Laboratory: 30 Project/seminars: -		No. of credits 6
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		ECTS distribution (number and %) 6 100%
Responsible for subject / lecturer: dr inż. Stefan Brock email: Stefan.Brock@put.poznan.pl tel. 48 61 665 2627 Wydział Elektryczny ul. Piotrowo 3A 60-965 Poznań		Responsible for subject / lecturer: dr hab. inż. Stefan Brock email: Stefan.Brock@put.poznan.pl tel. 48 61 665 2627 Faculty of Electrical Engineering ul. Piotrowo 3A 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	K_W06: K_W15: K_W16:
2	Skills	K_U05: K_U11: K_U14:
3	Social competencies	K_K01:
Assumptions and objectives of the course: The aim of the course is to learn construction, programming methods and typical applications of programmable controllers (PLC) and industrial regulators. Student at the end of training should be able to design and program systems with PLC. Students can also choose properly the industrial regulators to a particular object technology.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. K_W18 - [K_W18] 2. K_W17 - [K_W17] 3. K_W22 - [K_W22]		
Skills:		
1. K_U18 - [K_U18] 2. K_U14 - [K_U14] 3. K_U10 - [K_U10]		
Social competencies:		
1. K_K01 - [K_K01]		
Assessment methods of study outcomes		
Lecture: Assessment of the lecture is written exam of based on design case solution. Laboratory: Assessment of laboratory requires doing indicated exercises and giving reports.		

Course description		
<p>A lecture with a multimedia presentation (including drawings, photos, animations and movies) supplemented with examples on the board. Interactive lectures with questions to a group of students or to the identified students.</p> <p>Classification and field of application of programmable controllers. PLC hardware: controller architecture, input and output modules, function blocks, PLC family. Elements of controllers equipment : sensors, actuators. Typical properties and applications of sensors: mechanical, inductive, capacitive, ultrasonic and optical. Integrated sensor for temperature, pressure, level and other process parameters. PLC programming according to IEC 61131. Programming Languages: function blocks, ladder logic, sequential functional chart, structured text. Implementation of typical structures of automation. Operator panels. Analysis of algorithms used in industrial controllers, including controllers with two degrees of freedom. Controller tuning methods. Practical issues for regulators use different facilities. During the lecture, students analyze and implement topics of projects related to the unit's scientific research, especially in the field of implementation of digital control algorithms on programmable controllers. Laboratory exercises illustrate the issues discussed during the lectures. The projects are implemented in teams in which various methods of solving problems (including unconventional ones) are analyzed and discussed. The reports prepared by the teams are reviewed by the laboratory leader and discussed during the classes.</p> <p>Update 2017: Extension of the group of algorithms analyzed during the lecture to controllers with two degrees of freedom.</p>		
<p>Basic bibliography:</p> <ol style="list-style-type: none"> 1. Lecture materials provided by the teacher in electronic form 2. Hugh Jack, P.Eng. Michigan, USA: Automating Manufacturing Systems with PLCs (free on-line access) 3. Brock S. i in: Sterowniki programowalne, , Wydawnictwo Politechniki Poznańskiej 4. Legierski T. Programowanie sterowników PLC, 		
<p>Additional bibliography:</p> <ol style="list-style-type: none"> 1. Technical documentation PLC and industrial controls manufacturers 2. Pietruszewicz K., Skoczowski S., Osypisk R.: Odporna regulacja PID o dwóch stopniach swobody 3. Kasprzyk J.: Programowanie sterowników przemysłowych, Wydawnictwa Naukowo-Techniczne 		
Result of average student's workload		
Activity	Time (working hours)	
1. Lectures	45	
2. Laboratory exercises.	30	
3. Consultations and examination	20	
4. Preparation to laboratory exercises and elaboration of reports.	30	
5. Preparation to tests and examination.	25	
Student's workload		
Source of workload	hours	ECTS
Total workload	150	6
Contact hours	80	3
Practical activities	75	3