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 **-**	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				No. of credits
Lecture: **45** Classes: **-** Laboratory: **30** Project/seminars: **-**				**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	ECTS distribution (number and %**)**

Responsible for subject / lecturer:	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	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

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. Controller tuning methods. Practical issues for regulators use different facilities. Laboratory exercises illustrate the issues discussed during the lectures.

Basic bibliography:

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 Poznańskie

4. Legierski T. Programowanie sterowników PLC, Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, Gliwice, 1998.

Additional bibliography:

1. Technical documentation PLC and industrial controls manufacturers

2. Pietrusewicz K.. Skoczowski S., Osypisk R.: Odporna regulacja PID o dwóch stopniach swobody

3. Kasprzyk J.: Programowanie sterowników przemysłowych, Wydawnictwa Naukowo-Techniczne

<table>
<tr><td colspan="2" align="center">**Result of average student's workload**</td></tr>
<tr><td align="center">**Activity**</td><td align="center">**Time (working hours)**</td></tr>
<tr><td>1. Lectures</td><td>45</td></tr>
<tr><td>2. Laboratory exercises.</td><td>30</td></tr>
<tr><td>3. Consultations and examination</td><td>20</td></tr>
<tr><td>4. Preparation to laboratory exercises and elaboration of reports.</td><td>30</td></tr>
<tr><td>5. Preparation to tests and examination.</td><td>25</td></tr>
<tr><td colspan="2" align="center">**Student's workload**</td></tr>
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Source of workload	hours	ECTS
Total workload	150	6
Contact hours	80	3
Practical activities	75	3