STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Programmable and Digital Controllers	**1010331261010332693**

Field of study	Profile of study (general academic, practical)	Year /Semester
Automatic Control and Robotics	**general academic**	**3 / 6**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Robotics	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**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)	(university-wide, from another field)
other	**university-wide**

Education areas and fields of science and art	ECTS distribution (number and %)

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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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

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.

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.

Update 2017: Extension of the group of algorithms analyzed during the lecture to controllers with two degrees of freedom.

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,

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

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