STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Microprocessor-based control and measurement systems	**1010332221010335633**

Field of study	Profile of study (general academic, practical)	Year /Semester
Automatic Control and Robotics	**(brak)**	**1 / 2**
Elective path/specialty	**Subject offered in:**	**Course (compulsory, elective)**
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-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)
(brak)	**(brak)**

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

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	He has ordered and expanded knowledge of the methods of analysis and design of control systems. He has specialized expertise in the field of remote systems, distributed real-time systems and networking techniques.
2	**Skills**	Able to critically use the information literature, databases, and other sources, has the skills of self-education in order to improve and upgrade professional skills. Able to develop detailed documentation, analyze the results and give a presentation on the implementation of the tasks of design and research. K_U15: Able to apply the principles of occupational health and safety appropriate for the job automation and robotics.
3	**Social competencies**	Is aware of and understands the importance and impact of non-technical aspects of engineering including its impact on the environment, and hence the responsibility for decisions.

Assumptions and objectives of the course:

The aim of the course is to familiarize students with current microprocessor systems and peripheral systems used in automation and industrial electronics, especially in control systems, control and measurement.

Study outcomes and reference to the educational results for a field of study

Knowledge:

Skills:

Social competencies:

Assessment methods of study outcomes

Lecture: written examination (theoretical knowledge test) in the field of programming content.

Laboratory: examining the practical skills of programming and microprocessor systems control and measurement, evaluation and reporting of tests.

Course description

Lecture with multimedia presentation (including: drawings, photos, animations, sound, films) supplemented by examples given on the board. The presented content relates to current technical aspects in close connection with practice.

Program content:

ARM architecture microcontrollers (STM32, Arduino (2017), Raspberry Pi (2017), signal processors for embedded control and data acquisition (SHARC). Construction of advanced measurement cards and collaboration with the environment (LabView). Selected issues for A / C and C / A converters. Selected methods of programming microprocessor and control and measurement systems. Methods of measuring selected physical quantities? voltage, current, speed, position, force and torque, temperature and other non-electrical values. Implementation of selected tasks in microprocessor systems: filters and regulators. Data transmission in control systems? Implementation of wired standards (CAN, RS-232/485, LIN (2017), MOST (2017), Byteflight (2017) and wireless (IrDA, ZigBee (2017), Bluetooth). Analysis of selected practical implementations? recorders, industrial process control systems, DC and AC motor control.

Lab. Laboratory classes are divided into two parts: the first students will learn about the construction and installation of a measuring card and software card in the LabView language. The second part of the software is an ARM (STM32) microcontroller in a high-level language, which measures the selected physical quantities and controls the drive systems. The work consists of team programming.

Basic bibliography:

1. Steven W. Smith: Cyfrowe przetwarzanie sygnałów.Wyd. BTC, Warszawa 2007
2. Steven W. Smith: Digital signal processing.Wyd. BTC, Warszawa 2007.
3. Dokumentacja techniczna dotycząca mikrokontrolerów o architekturze ARM typu Cortex
4. Nawrocki W. ?Komputerowe systemy pomiarowe?, WKŁ, Warszawa 2006

Additional bibliography:

1. Dąbrowski A., (red.), Przetwarzanie sygnałów przy użyciu procesorów sygnałowych, Wyd. Politechniki Poznańskiej, Poznań 2000
2. Dąbrowski A., (red.), Przetwarzanie sygnałów przy użyciu procesorów sygnałowych, Wyd. Politechniki Poznańskiej, Poznań 2000

Result of average student's workload

Activity	Time (working hours)
1. Participation in lecture classes	45
2. Participation in laboratory activities	30
3. Participation in consultation	10
4. Preparation for laboratory	18
5. Develop reports on tests and measurements	15
6. Exam Preparation	30
7. Participation in the exam	2

Student’s workload

Source of workload	hours	ECTS
Total workload	150	6
Contact hours	87	3
Practical activities	45	2