STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Microprocessors systems**		Code **1010341761010322704**
Field of study **Mathematics in Technology**	Profile of study (general academic, practical) **General academic**	Year /Semester **3 / 6**
Elective path/specialty **Electronic circuits and measurement**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies** **(Polish Qualifications Framework level six)**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **30** Classes: **-** Laboratory: **30** Project/seminars: **-**		No. of credits **4**
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** **Technical sciences**		ECTS distribution (number and %) **4 100%** **4 100%**

Responsible for subject / lecturer:

Dr inż. Michał Bołtrukiewicz
email: Michal.Boltrukiewicz@put.poznan.pl
tel. 61 6652032, 61 6652632
61 665 2032
Faculty of Electrical Engineering
ul. Piotrowo 3A, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of digital electronics and also in scope of C++ programming language [K_W06 (P6S_WG)]
2	**Skills**	Can design a simple combinational circuit. Can write a simple program in C++ [K_U11 (P6S_UW)].
3	**Social competencies**	Observe the rules of ethics in scope use of software [K_K04 (P6S_KR)].

Assumptions and objectives of the course:

Knowledge in scope of architecture and principles of operation of microprocessor system and also properties of microcontrollers, their programming languages and debugging tools

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

Knowledge:

1. Has basic knowledge in scope of microprocessors architecture and microprocessor systems using microcontrollers [K_W04 (P6S_WG)].
2. Has basic knowledge in scope of programming languages and debugging tools for microcontrollers [K_W08 (P6S_WG)].

Skills:

1. Can design of algorithm, use of programming languages and debugging tools in scope of microprocessor [K_U04 (P6S_UW), K_U06 (P6S_UW)].
2. During the tests of microprocessor system can acquire of specialistics knowledge from catalogs [K_U13 (P6S_UK)].

Social competencies:

1. Can ask a precisely questions for the purpose of the better understanding of problems [K_K01 (P6S_KK), K_K02 (PS6_KK)].

Assessment methods of study outcomes

Lecture: Examination in writing.

Laboratories: Current estimating of knowledge and skills. Current estimation of ability to programming. Evaluation of prepared reports from laboratories.

Course description

Last update 2018:

Methods of education are orientated to students to motivate them to participate actively in education process by discussion and reports.

Lectures: Multimedia presentations expanded by examples shown on a board. Activity of students is taken into consideration in final students evaluation. Theoretical questions are presented in the exact reference to the practice.

Laboratory: Detailed reviewing of particular exercises reports. Realization of laboratory tasks in teams. Specific computational experiments.

Architecture and principle of operation of microprocessor, single-chip microcomputer and microcontroller. Memory map and architecture of microprocessors system. Addressing modes and format of instructions. Programming languages of microprocessors: assembler and C++. Design of microprocessors systems. Harvard and von Neumann architectures of microcontroller. Internal resources and principle of operation of internal I/O chips: A/D converters, counters and PWM outputs. Co-operation with external I/O chips (example: LCD display) and measuring sensors. Interfaces of communication: USB, USART, I2C, SPI, 1-Wire.

Basic bibliography:

1. Baranowski R. Mikrokontrolery AVR AT MEGA w praktyce. Wydawnictwo BTC, Warszawa 2005.
2. Kniat J. Programowanie obiektowe w języku C++. Wydawnictwo Politechniki Poznańskiej, Poznań 1995.
3. Bogusz J. Lokalne interfejsy szeregowe w systemach cyfrowych. Wydawnictwo BTC, Warszawa 2004
4. Sibigtroth J.M. Zrozumieć małe mikrokontrolery, Wydawnictwo BTC, Warszawa 2003.
5. Pełka R. Mikrokontrolery architektura, programowanie, zastosowania. WKiŁ, Warszawa 1999.
6. Tietze U., Schenk Ch. Układy półprzewodnikowe, WNT Warszawa 1996.

Additional bibliography:

1. Hajduk Z., Mikrokontrolery w systemach zdalnego sterowania. Wydawnictwo BTC. Warszawa 2005.
2. Horowitz P., Hill W., Sztuka elektroniki t.2. WKiŁ, Warszawa 1996
3. Mielczarek., Szeregowe interfejsy cyfrowe, Wydawnictwo Helion, Gliwice 1993.

Result of average student's workload

Activity	Time (working hours)
1. Lectures	30
2. Laboratories	30
3. Consultations	8
4. Preparation of reports from laboratories	10
5. Preparation for the laboratories	15
6. Preparation for the examination	15
7. Examination.	2

Student's workload

Source of workload	hours	ECTS
Total workload	110	4
Contact hours	70	3
Practical activities	55	2