STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Microprocessor systems		**1010331151010339041**
Field of study	Profile of study (general academic, practical)	Year /Semester
Automatic Control and Robotics	**(brak)**	**3 / 5**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
First-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **30** Classes: **-** Laboratory: **30** Project/seminars: **-**		**5**
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:

dr inż. Dominik Łuczak
email: Dominik.Luczak@put.poznan.pl
tel. 48 61 665 2557
Wydział Elektryczny
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	K_W08: He has ordered knowledge of the theory of electrical circuits and electrical DC and AC (in this phase). K_W10: He has ordered knowledge of selected algorithms and data structures as well as the methodology and techniques of procedural and object-oriented programming. K_W12: He has ordered and theoretically founded knowledge of the principles of basic electronic components, analog and digital, some electronic circuits and systems.
2	**Skills**	K_U01: Can obtain information from literature, databases, and other sources; It has the skills of self-education in order to improve and update professional competence. K_U16: It can read and understand project technical documentation and simple flowsheets and automation systems and robotics. K_U20: Can build, run, and test a simple electronics, and electromechanical.
3	**Social competencies**	K_K01: Understands the need and know the possibilities of continuous training improve professional skills, personal and social, able to inspire and organize the learning of others.

Assumptions and objectives of the course:

The aim of the course is to learn the basics of theoretical and practical construction and operation of microprocessors systems for measurement and control applications. Student after completion of education should be able to design device with microcontroler and program basic funcionality using high-level language.

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

Knowledge:

1. He has a basic knowledge of architectures and programming of microprocessor systems, knows the selected languages of high and low-level programming microprocessors, knows and understands the basic principle of operation of peripheral modules and communication interfaces in microprocessor systems. - [K_W15]

2. He has ordered and theoretically founded knowledge of the principles of basic electronic components, analog and digital, some electronic circuits and systems. - [K_W12]

3. He ordered knowledge of computer architectures, systems, and computer networks and operating systems including real time operating systems. - [K_W13]

Skills:

1. He can construct a solution algorithm simple task of measuring and compute-control and implement, test, and run it in your chosen development environment on a platform of microprocessor. - [K_U03]

2. Can design simple mechanical systems and electrical and electronic equipment intended for different applications (including material properties). - [K_U06]

3. He can build, run, and test a simple electronics and electromechanical device - [K_U20]

Social competencies:
1. He understands the need and know the possibilities of continuous training improve professional skills, personal and social, able to inspire and organize the learning process of others. - [K_K01]

Assessment methods of study outcomes
Lectures: assessment of knowledge and skills shown on the final exam of a problem - design. Laboratories: current control of knowledge necessary for the accomplishment of the problems in the area of tasks in the laboratory, rewarding gain skills they met the principles and methods, assessment of ability to use the acquired knowledge and skills to implement a complex system.
Course description
Construction and operation of microprocessors. Basic types of microprocessors. Construction of the system microcomputer. Systems environment CPU: memory address decoders. Principles of microprocessor programming in high level language. Examples of environmental programming microcontrollers. Programming microprocessors. Microcontrollers and signal processors. Systems peripheral microcontrollers: timers, counters, PWM circuits, other peripheral devices. Support for external devices by a microprocessor system. Interrupts and DMA system. Digital / analog and analog / digital conversion. Principles of design of microprocessor systems. Interface circuits microprocessor systems with input elements and actuators. Communication buses used in microprocessor systems - standard UART, SPI, I2C, 1-wire, USB. Methods startup microprocessor systems. Laboratory exercises allow practical use of the knowledge acquired during lectures. The student perform exercise on the microprocessor platform. Difficulty of task is adjusted by teacher.
Basic bibliography:
1. Lecture materials made available by the lecturer in electronic form 2. M. Rafiquzzaman, Fundamentals of Digital Logic and Microcontrollers, 6th Edition, 2014 3. Ying Bai, Practical Microcontroller Engineering with ARM- Technology
Additional bibliography:
1. Łuczak D.: DSP implementation of adaptive digital filter for resonant frequency reduction in direct drive, Poznan University of Technology Academic Journals. Electrical Engineering, Vol. 71, str. 41-48, Poznań 2012, ISSN 1897-0737 2. D. Łuczak i A. Wójcik, DSP implementation of state observers for electrical drive with elastic coupling, Przegląd Elektrotechniczny, t. 1, nr 5, ss. 100?105, maj 2016, ISSN 0033-2097. 3. Łuczak D: DSP implementation of selected algorithms for spectral analysis, Poznan University of Technology Academic Journals. Electrical Engineering, Vol. 71, str. 95-101, Poznań 2012, ISSN 1897-0737 4. Donald S. Reay, Digital Signal Processing Using the ARM Cortex M4, 2015 5. Dogan Ibrahim, Microcontroller Based Applied Digital Control, 2006 6. Frank Vahid, Tony D. Givargis, Embedded System Design: A Unified Hardware/Software Introduction 2002

Result of average student's workload

Activity	**Time (working hours)**
1. Lectures	30
2. Laboratory exercises	30
3. Consultations and examination	5
4. Preparation to laboratory exercises and elaboration of reports	60
5. Preparation to tests and examination	20

Student's workload

Source of workload	**hours**	**ECTS**
Total workload	145	5
Contact hours	65	2
Practical activities	90	3