STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Microprocessor technology**		Code **1010312321010321118**
Field of study **Electrical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **1 / 2**
Elective path/specialty **Distribution Devices and Electrical**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **15** Classes: **-** Laboratory: **15** Project/seminars: **-**		No. of credits **2**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **2 100%** **2 100%**

Responsible for subject / lecturer:

dr inż. Grzegorz Trzmiel
email: Grzegorz.Trzmiel@put.poznan.pl
tel. 616652693
Wydział Elektryczny
ul. Piotrowo 3A 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of mathematics, physics, fundamentals of electrical engineering and electronics, including digital.
2	**Skills**	The ability to understand and interpret knowledge transmitted in the classroom. The ability to effectively self-education in a field related to the chosen field of study.
3	**Social competencies**	The awareness of the need to expand their competence, their willingness to cooperate within the team.

Assumptions and objectives of the course:

Thorough knowledge of theoretical and practical problems associated with the construction elements, components and microprocessor systems and the basis of their programming and design.

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

Knowledge:

1. characterize the structure and principles of the basic elements and the processor - [K_W07+++, K_W10++]
2. explain the operation of processor and microprocessor systems - [K_W07+++, K_W18++, K_W08++]
3. use knowledge of high-level programming using object-oriented programming elements - [K_W07+++]

Skills:

1. apply his knowledge of the theory of digital circuits required to determine the important parameters of of data transmission and commands - [K_U01++, K_U05+]
2. obtain information from the literature and the Internet, work individually and independently solve problems in the theory of systems analysis and design and microprocessor devices - [K_U01++, K_U07+]

Social competencies:

1. able to think and act in an entrepreneurial manner in the area of analysis microprocessors - [K_K01+, K_K02++]

Assessment methods of study outcomes

Lecture:

- Assess the knowledge and skills shown on the completion of writing of microprocessor technology.

Laboratory:

- Test and rewarding knowledge necessary for the accomplishment of the problems in the area of ??laboratory tasks.
- Continuous assessment for each course - rewarding the increase in the ability to use principles and methods have met.
- Assess the knowledge and skills related to the implementation of the tasks of exercises, evaluation of individual tasks in practice.

Get extra points for activity in the classroom, and in particular for:

- Proposing to discuss additional aspects of the subject,
- The effectiveness of applying knowledge when solving a given problem,
- Ability to work within a team practically performing the task detailed in the laboratory,
- Comments relating to the improvement of teaching materials,
- Aesthetic diligence reports and jobs - in the framework of self-study.

Course description

Applied methods of education: lectures: 15 h., laboratories: 15 h.

Lecture:

The idea of pipelining. Architecture microprocessors. Construction, types (classifications), features and basic functionality of a microcontroller. Microcontrollers closed (embedded). The microprocessor core. The oscillator and clock signal distribution systems. Methods for power reduction. Special modes microcontroller. RESET. Sources RESET. Systems supervising the correct operation of the microcontroller. Watchdog. Methods of cooperation with peripherals. Systems interrupts. Programming nested. Basic programming languages. Commissioning and testing programs. CAN interface: features, systems, types of frames (without detailed structures), model of communication, error detection mechanisms, concepts construction node, electromagnetic interference advantages. LIN interface. Profibus.

Updated 2017: Presenting innovative solutions in the field of microprocessor technology, applied in the latest solutions in various industries.

A multimedia presentation with figures, diagrams, photos, supplemented with practical examples on the board, slides and computer programs, facilitating the linking of theory to practice. Lecture supplemented with additional materials provided to students for self study.

Use students' knowledge of other subjects, initiate discussions, ask questions to increase student activity and autonomy.

Laboratories: Getting to know the architecture of an exemplary microcontroller and microcontroller programming in C in terms of handling internal and external devices. Basics of C51 language specification, implementation programs, use of selected internal systems, among others, timers and interrupt system, serial, AC transducer. Implementation of external devices, among others, LCD, LED, matrix keyboard. Implementation of the exemplary cooperation project microprocessor system with an external device.

Using tools to enable students to perform tasks at home (microcontroller simulator with peripherals, specialized software for programming microcontrollers). Classes at the university supplemented by materials for self-employment on free software packages.

Basic bibliography:

1. Jabłoński T., Pławsiuk K., Programowanie mikrokontrolerów PIC w języku C, BTC, Warszawa 2005.
2. Krzyżanowski R., Układy mikroprocesorowe, Mikom, Warszawa 2004.
3. Pietraszek S., Mikroprocesory jednoukładowe PIC, Wyd. Helion, Gliwice, 2002.

Additional bibliography:

1. Jabłoński T., Mikrokontrolery PIC16F8x w praktyce, Wyd. BTC, Warszawa, 2002.
2. Francuz T., Język C dla mikrokontrolerów, od podstaw do zaawansowanych aplikacji, Helion, Gliwice 2011,
3. Tatjewski P., Sterowanie zaawansowane obiektów przemysłowych. Struktury i algorytmy, Akademicka Oficyna Wydawnicza EXIT, Warszawa, 2002.
4. Piasecki A., Trzmiel G., Remote building control using the bluetooth technology, Monograph Computer Applications in Electrical Engineering, Poznan University of Technology 2016, vol. 14, pp. 457 ? 468.
5. Diploma theses.
6. Internet.

Result of average student's workload

Activity	Time (working hours)

1. participation in class lecture	15
2. participation in laboratory classes	15
3. consultation on the lecture	2
4. consultation on the laboratory	3
5. preparation to pass	10
6. pass	2
7. preparation for laboratory exercises and pass the laboratory	12
8. grade the laboratory	2

Student's workload

Source of workload	hours	ECTS
Total workload	61	2
Contact hours	39	1
Practical activities	32	1