POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name

Programming of 32-bit microcontrollers

Course

Field of study	Year/Semester
Mechatornics	1/1
Area of study (specialization)	Profile of study
	general academic
Level of study	Course offered in
Second-cycle studies	Polish
Form of study	Requirements
full-time	

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	30	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

Phd Eng. Dominik RYBARCZYK

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tel. 61 665 2187

Faculty of Mechanical Engineering

Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge   Basic knowledge of mechatronics, automation, electrical engineering, electronics, computer control, sensors, drives.

Skills   Microcontroller skills, programming in C++ language, design of basic electronic circuits.

Social competencies   Understanding the importance of electronics for the development of the country's economy. Awareness of necessity for broadening knowledge and skills.

Course objective

Introduction to the design, operation, design and programming of 32-bits micorcontrollers.

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Course-related learning outcomes

Knowledge

1. Construction and basic parameters of 32-bit microcontrollers

2. Knowledge of signal transmission in computer controllers

3. Knowledge about interface methods used in electronics

4. Programming of micorcontrollers

Skills

1. Analysis of the structure and capabilities of various types of microcontrollers, especially STM32 family

2. Ability to programming in C language

3. Ability to integrate different mechatronic devices in complex production system

4. Designing electronic systems based on 32-bit microcontrollers

Social competences

1. Understanding the requirement of learning by whole life; ability to inspire and organize learning process of other people

2. s aware of the role of electronics in modern economy and its importance for the development of society and the environment

3. Ability to think and act in a creative and enterprising way

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture and labolatory:

- pass on the basis of a test. Scale of estimate: 51-60% - 3,0 (C), 61-70% - 3,5 (C+), 71-80% - 4,0 (B), 81-90% - 4,5 (B+), 91-100% - 5,0 (A).

Programme content

1. Architecture of 32-bit microcontrollers programming environments, basic registers, support for external interrupts

2. Counter systems in 32-bit microcontrollers and their applications, support for PWM output, support for basic Systick counter, support for incremental encoders

3. Analog-to-digital converters, interrupt handling from the ADC converter, DMA controller, examples of applications,

4. Serial interfaces used in 32-bit UART / USART microcontrollers, examples of applications, SPI interface, TFT and OLED display support

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5. I2C interface, inertial sensors, basics of signal filtration: Kalman filter, alpha / beta filter

6. RTOS real-time operating system in 32-bit microcontrollers

Laboratory:

1. Introduction, evaluation kits overview

2. Development environment overview

3. Digital inputs / outputs

4. External interrupts - handling

5. External interrupts - examples of applications

6. Timers

7. Timers - support for incremental encoders

8. PWM generation

9. UART communication

10. ADC converter by polling method

11. ADC converter - interrupts

12. DMA controller

13. SPI interface

14. I2C interface

15. Class passing

Teaching methods

Lecture/Labolatory

Bibliography

Basic

1.   Paprocki K. „Mikrokontrolery STM32 w praktyce".

2.   Gońka K., „PODSTAWY .NET MICRO FRAMEWORK DLA MIKROKONTROLERÓW STM32 W JĘZYKU C#".

3.   Brzoza-Woch R., Schenk Ch. „Mikrokontrolery AT91SAM7 w praktyce".

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Additional

1. Technical data on internet, datasheets etc.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam) [1]	30	1,0

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[1] delete or add other activities as appropriate