SYLLABUS

Name: ***Embedded systems (AESAu>SI6ES24)***
Name in Polish:
Name in English: ***Embedded systems***

Information on course:

Course offered by department: Faculty of Automatic Control, Electronics and Computer Science
Course for department: Silesian University of Technology

Default type of course examination report:

ZAL

Language:

English

Short description:

The goal of this course is to introduce students to the structure of embedded systems and how to create programming that allows for the implementation of multiple tasks with various peripherals. The course also presents methods for optimizing power consumption

Description:

ECTS: 4
Total workload: 100 (60 contact hours / 40 student's own work hours)
Lecture: 30h
Laboratory: 30h

Student's own work: preparation for classes, writing reports
Lecture
1. Introduction to Embedded System:
1.1. Overview of embedded systems, their development history, application areas, and the STM32 series microcontrollers.
1.2. Transitioning From CPU to MCU. Evolution of ARM architecture.
2. Hardware Fundamentals:
2.1. The fundamentals of hardware parts in MCU, like CPU, memory, bus and peripherals.
2.2. The CPU Structure with ARM Architecture. Concept and Mechanism of Interrupt. Reset, Clock, Memory and Bus.
3. Peripheral Development:
3.1. The Most Common Peripheral: GPIO, Register-Level Programming.
3.2. Software tools for STM32 Development. C Language Used in Embedded Development.
3.3. GPIO Standard Library Programming.
3.4. GPIO and timers Interrupt Principle and Programming, principle of operation of interrupt controller NVIC.
3.5. Asynchronous Serial Communication(UART) and Serial Peripheral Interface(SPI).
4. Practical Instruction to learn how to build STM32 projects on Keil platform, use debugging and write relatively complex program.

Bibliography:

1. Zhu Y.F. Embedded System with ARM Cortex-M Microcontrollers in Assembly Language and C (Fourth Edition), E-Man Press LLC, Jan. 2023
2. Zhang S.Q. etc. Principle and Application of STM32 Embedded Microcontroller (in Chinese), China Machine Press, Feb. 2020

Learning outcomes:

Through the theoretical teaching and experimental training of this course, students will have the following abilities:
1. Knows the fundamental theories for embedded system development, including C programming language, basic principles of common peripherals, basic principles of common communication interfaces (KA1_W2, KA1_W6, KA1_W8).
2. Knows how to use the software and hardware tools for embedded system development, including Keil MDK, serial port assistant, character encode software and development board for STM32 (KA1_W9, KA1_W11).
3. Is able to write and debug the driving programs for the common peripherals, mixed analogue-digital converters and communication interfaces based on the Keil platform, as well as verifying the program functions on the STM32 development board. (KA1_W10, KA1_W11, KA1_W12)
4. Is able to achieve design of the embedded systems having complex function with a team mode, including software programming, hardware constructing. During the implement process, can utilize the knowledge of each member and concern the design cost which would be influenced by some factors such as the used quantities of internal sources, the specifications of prices of external devices, and the size of codes (KA1_U10, KA1_U13).

Assessment methods and assessment criteria:

The condition for completing the course is passing all tests and submitting laboratory reports.

Course credits in various terms:

<without a specific program>

Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	4	2024/2025-Z	