Software for measurement and control equipment - course description

General information

Course name	Software for measurement and control equipment
Course ID	06.0-WE-AutP-SNCE-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Automatic Control and Robotics
Education profile	academic
Level of studies	First-cycle Erasmus programme
Beginning semester	winter term 2022/2023

Course information

Semester	5
ECTS credits to win	3
Course type	optional
Teaching language	english
Author of syllabus	• dr hab. inż. Janusz Kaczmarek, prof. UZ

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	15	1	-	-	Credit with grade
Laboratory	30	2	-	-	Credit with grade

Aim of the course

- Skills and competences in the field of designing and creating software for embedded systems with the emphasis on measurement and control equipment
- Shaping basic skills in developing embedded software in low and high level languages

Prerequisites

Principles of programming, Electronics principles, Foundations of digital and microprocessor engineering, Metrology

Scope

Microprocessor-based equipment for measurement and control. Selected elements of a microprocessor technique. Architecture of microprocessor devices for measurement and control.

Introduction to programming embedded systems. Integrated programming environments. Programming languages – assembler and high-level programming languages. Hybrid programming technique. Effective fixed-point arithmetic on fractional numbers. Methods of code optimization. Programming of internal and external peripherals.

Application of real-time operating system (RTOS) to design the software for embedded systems with low resources. Basic terms. Principles and aims of applying RTOS systems. Mechanisms of RTOS kernel. Scalability of RTOS. Examples of RTOS designed for embedded systems. Advantages of applying RTOS in measurement and control equipment.

Implementation of selected measurement and control algorithms. Control procedures for a/c and c/a converters. Programming methods for generating and measuring analog and digital signals. Implementation of loop control in industrial regulators.

Software and hardware debugging methods for embedded systems.

Teaching methods

Lecture: conventional lecture

Laboratory: laboratory exercises, group work

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Can carry out simple programming tasks in low and high level languages (assembler and C language) which are related to applications for measurement-control devices.		• a quiz • an ongoing monitoring during classes • carrying out laboratory reports	• Laboratory
Has a basic knowledge on data processing in microprocessor systems with limited hardware resources.		• an evaluation test • an ongoing monitoring during classes • carrying out laboratory reports	• Lecture • Laboratory

Outcome description	Outcome symbols	Methods of verification	The class form
Knows architecture of microprocessor measurement-control devices.		• an evaluation test	• Lecture

Assignment conditions

Lecture – the passing condition is to obtain a positive mark from the final test.

Laboratory – the passing condition is to obtain positive marks from all laboratory exercises to be planned during the semester.

Calculation of the final grade: lecture 40% + laboratory 60%

Recommended reading

1. Barney G.C.: Intelligent Instrumentation. Microprocessor Applications in Measurement and Control, Prentice Hall, 1988.
2. Krzyżanowski R.: Microprocessor circuits, Wydawnictwo Naukowe PWN, Warszawa, 2017 (in Polish).
3. Labrosse J.J.: Embedded System Building Blocks, CMP Books, 2000.
4. Tumański S.: Measuring Technique, PWN,WNT, Warszawa, 2019 (n Polish)
5. Mazidi M.A, Mazidi J.G, McKinlay R.D.: The 8051 Microcontroller and Embedded System Using Assembly and C , Pearson Education, 2007.

Further reading

Notes

Modified by dr hab. inż. Wojciech Paszke, prof. UZ (last modification: 11-04-2022 09:05)