RTU Course "Application of Microprocessors and Microcontrollers"

33000 Faculty of Computer Science, Information Technology and Energy

General data

Code	RRI702
Course title	Application of Microprocessors and Microcontrollers
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Dmitrijs Pikuļins
Academic staff	Juris Šīrs
Volume of the course: parts and credits points	1 part, 4.5 credits
Language of instruction	LV, EN
Annotation	The study course is dedicated to microprocessor and microcontroller technologies and their use, it is designed as an initial study course for students without prior knowledge. During the study course students will learn the basic principles of architecture, development cycle, algorithms for solving entry-level tasks, as well as practical initial skills for working with the integrated development environment Code Composer Studio, and strengthen the acquired knowledge during laboratory work with MSP type layout boards.
Goals and objectives of the course in terms of competences and skills	The goal of the study course is to provide theoretical knowledge and practical skills in microprocessor and microcontroller technologies and their use. Tasks of the study course: 1) To provide an understanding of the development of a microcontroller-based system in order to form an understanding of the hardware and software model of the microcontroller and their interconnection. 2) To introduce the possible architectural solutions of the microcontroller, with the characteristics of the most common peripheral modules. 3) To acquaint with microcontroller code development and configuration (debugging) tools. 4) Introduce the basic principles of software development. 5) To develop entry-level skills in microcontroller programming in C.
Structure and tasks of independent studies	Students must independently find solutions to entry-level tasks in preparation for and defense of laboratory work.
Recommended literature	Obligātā/Obligatory: MCF52211 ColdFire® Integrated Microcontroller Reference Manual Rev.2 Freescale 2007. (MCF52211RM), MSP430x20x1, MSP430x20x2, MSP430x20x3 Mixed signal microcontroller, msp430f2013.pdf , SLAS491E Texas Instruments, rev. 2010. MSP430xG461x Mixed signal microcontroller, msp430fg4618.pdf, SLAS508H, Texas Instruments, rev. 2009. MSP430x2xx Family User's Guide, slau144e.pdf, Texas Instruments, 2008. Code Composer Studio v4.1 User's Guide for MSP430, SLAU157M, Texas Instruments, rev.2010 MSP430 Hardware Tools User's Guide, SLAU278E, Texas Instruments, rev. 2010 MSP430x4xx Family User's Guide, SLAU056J, Texas Instruments, rev. 2010. MSP430 Optimizing C/C++ Compiler v3.2 User's Guide, SLAU132D, Texas Instruments, 2009. Programming languages – C, ISO/IEC9899:TC3 2007. Papildu/Additional: Cem Ünsalan, Hüseyin Deniz Gürhan, et al. Embedded System Design with ARM Cortex-M Microcontrollers: Applications with C, C++ and MicroPython. Springer; 1st ed. 2022 edition (583 p.) Fernando E. Valdes-Perez and Ramon Pallas-Areny. Microcontrollers: Fundamentals and Applications with PIC 1st Edition, Kindle Edition. RC Press; 1st edition 2017 (556 p.) Papildus minētajai literatūrai tiks izmantota informācija globālajā tīmeklī par kursa tēmu.
Course prerequisites	Basic computer skills, knowledge of some high level programming language, C or C++ is preferred. Students need own MSP-EXP430FR4133 development board.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Architecture of Microprocessor and microcontroller, peripheral modules.	4	6	0	0
Development tools.	4	6	0	0
Introduction to C.	4	6	0	0
Clock generator, FLL generator, timer module.	4	6	0	0
Input devices with contacts and signal processing algorithms.	4	6	0	0
Dynamic display devices, LCD A peripheral module.	4	6	0	0
Peripheral modules ACP, CAP, OA, USART.	4	6	0	0
Laboratory works.	16	24	0	0
Peculiarities of digital signal processor architecture	2	3	0	0
Digital signal controllers and their applications	2	3	0	0
Total:	48	72	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is able to analyse microprocessor and micro controller differences in architecture.	Theoretical part of exam, laboratory works.
Knows software evaluation steps and necessary equipment.	Theoretical part of exam, laboratory works.
Knows the properties of frequently used peripheral modules.	Theoretical part of exam, laboratory works.
Is able to apply practical skills for introductory level problem solutions.	Practical part of exam, laboratory works.

Evaluation criteria of study results

Criterion	%
Laboratory works	50
Exam	50
Total:	100

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	4.5	2.0	0.0	1.0		*	