Study programme	Applied Informatics and Programming		

Study module	EMBEDDED SYSTEMS	Credits in total	5

Learning outcomes
− Student is able to identify different microcontrollers by their types. − Is able to choose a different programming languages for different microcontrollers. − Knows how to connect external devices to the embedded system. − Is able to specify, design and implement embedded systems. − Will be able to program AVR and ARM type microcontrollers and use different data transfer protocols.
Aims of study module
The main purpose of this course is to provide knowledge of embedded system architectures, their hardware and software realization methods.
Annotation of a study module
An embedded system is a computer system designed for specific control functions within a larger system, often with real-time computing constraints. Embedded systems core component is a programmable microcontroller, which performs information processing and management. The aim of this course is to introduce students to embedded systems and their components, as well as to teach microcontroller programming fundamentals. During laboratory activities we will be using AVR and ARM-based microcontrollers, C/C++ and assembly programming languages. We will programm: I/O devices, PWM, ADC, communication protocols: SPI, I2C, USART, 1-Wire, as well as the ZigBee wireless communication protocols and etc.
Topics of the subject
1. Introductory lectures 2. Embedded system hardware and software realization 3. Embedded systems programming languages and specifications 4. Input / Output devices 5. Interrupts 6. Timers 7. Puls width modulation 8. Analog to digital and digital to analog converters 9. Data collection and digitization 10. Data transmission and analysis 11. Data mapping to LCD screens and other devices 12. I2C protocol 13. SPI protocol 14. Wireless communication use in embedded systems 15. Multiprocessing Systems
Procedure for assessment of knowledge and competences
Ten grade and gathered evaluation system is applied. The semester's individual work tasks are evaluated by grades; the final grade is given during the examination session while multiplying particular grades by the lever coefficient and summing the products.
Main literature
1. T. Braunl. (2008). Embedded robotics : mobile robot design and applications with embedded systems. New York : Springer. 546 psl. 2. V. Urbanavičius. (2007) Kompiuteriai ir jų architektūra. Vilnius. Technika. 426 psl. 3. V. Deksnys, V. (2000) Jastrauskas. 8 skilčių sistemos. Kaunas.

[*] Short form