UNIVERSITY OF LJUBLJANA
Faculty of Mechanical Engineering

Digital Control Technology (6054-M) 5 ECTS

Lecturer: D. Kozjek, G. Škulj

Lectures: 30h | Tutorials: 12h | Labs: 18h | Project: 0h | Lang. :

Objectives

- To learn the structure and operation of modern digital platforms (microcontrollers, embedded computers, FPGA circuits) and the possibilities of their use in mechatronics and control systems, to understand their capabilities and specifications.
- To learn the methods and procedures of hardware development for control applications based on microcontrollers, embedded computers, and FPGA circuits with particular emphasis on an interdisciplinary approach.
- To learn the methods and procedures for the development of controller software for microcontrollers.

Programme

1. Introduction, Course Overview
2. Digital integrated circuits
3. Sequential Logic Systems, Microprocessor, and Microcontroller
4. Microcontroller architectures
5. Power interfaces
6. Digital IO, counters and timers
7. AD and DA converters
8. Interrupt system
9. Serial communications with microcontrollers
10. Standard buses in microcontroller applications
11. Low power microcontroller applications
12. Operating systems for real-time processing (RTOS, FreeRTOS)
13. Embedded computer and Linux
14. FPGA circuits

Prerequisites

It is good to have the following knowledge and skills before the start of this course:

- Basic knowledge about electricity
- Knowledge and understanding of the operation of basic electronic components (resistor, diode, switch, transistor, capacitor, etc.)

Learning outcomes

After attending this course, the student will obtain the following knowledge/skills:

- In-depth theoretical, methodological and analytical knowledge on applications of microcontrollers and other digital control circuits in mechatronics, which is the basis for demanding professional work and enables the carrying out of leading tasks in interdisciplinary development teams in the field of mechatronics.
- Mastering highly comprehensive, complex workflows and methodological tools in the field of mechatronics.
- Design and manage workflows based on creative problem solving related to mechatronics.

Assessment

50% Theoretical exam, 50% Laboratory work

Literature

1. Alvano J. Embedded Systems: Real-Time Operating Systems for Arm Cortex M Microcontrollers – 2nd edition. CreateSpace Independent Publishing Platform, 2012.
2. Johnson A. More to C - Advanced Programming with C in Linux and on Raspberry Pi – 1st edition. CreateSpace Independent Publishing Platform, 2017.
3. Monk S. Programming FPGAs: Getting Started with Verilog – 1st edition. McGraw-Hill Education TAB, 2016.