COURSE DESCRIPTION CARD - SYLLABUS

Course name
Programmable Logic Devices in Control Appliaction

Course

Field of study
Automatyka i Robotyka
Area of study (specialization)

Level of study
First-cycle studies
Form of study
full-time

Year/Semester
3/6
Profile of study
practical
Course offered in
Polish
Requirements
elective

Number of hours

Lecture
15
Laboratory classes
30
Other (e.g. online)

Tutorials
Projects/seminars

Number of credit points

Lecturers

Responsible for the course/lecturer:
Dariusz Janiszewski

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of programming in high-level languages. Basic knowledge of digital electronics and techniques with signal processing introduction.

Course objective

The aim of the course is to learn about the construction, programming methods and typical applications of programmable logic circuits in fast control field.

The aim of the classes conducted as part of the lecture is to teach the student how to use the device description language, on the example of the VHDL language, for designing digital circuits. The basics of the language as well as complex digital systems are presented. In the laboratory, students get acquainted with the commercial Intel Quartus and Xilinx Vivado packages, which allow to create a digital control system design, perform its behavioral and time simulation, as well as synthesis, implementation into a programmable structure. After completing education, the student should be able to design and program fast control systems with digital procesing.

Course-related learning outcomes

Knowledge

student has structured knowledge of computer architectures, computer systems and networks as well as operating systems, including real-time operating systems;[K1_W9++]

student knows and understands at an advanced level the structure and principles of operation of programmable industrial controllers as well as their analog and digital peripheral systems; knows and understands the principle of operation of basic communication interfaces used in industrial control systems; [K1_W19 +]

Skills

student can use selected tools for rapid prototyping of automation and robotics systems; [K1_U13 +],

student can select the parameters and settings of the basic industrial controller and configure and program an industrial programmable controller; [K1_U18 +],

student can identify and formulate the specification of simple engineering tasks in the field of automation and robotics; [K1_U23 +],

student can design and implement a local teleinformation network (including industrial one) by selecting and configuring communication elements and devices (wired and wireless); [K1_U28 +]

Social competences

student is aware of responsibility for their own work and readiness to submit to the rules of teamwork and responsibility for jointly performed tasks; can lead a small team, set goals and set priorities leading to their implementation; is ready to perform professional roles responsibly; [K1_K3 ++]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: A written/oral exam of a problem-design character is the pass of the lecture.

Laboratory: Passing laboratory exercises requires the implementation of the indicated exercises and ongoing evaluation of the progress and result of their implementation.

Programme content

Classification and area of application of electronic programmable systems.

Selected programmable elements from such manufacturers as Altera, Xilinx.

Components functional elements of PAL, GAL, PLD, CPLD, FPGA circuits.

Methods of programming digital circuits.

Subtwork of programming digital circuits in VHDL language.

Complex elements of the VHDL language and libraries.

Construction of own microprocessor with a specific architecture and list of operations.

Laboratory and project exercises illustrate the issues discussed in the lectures, and focus mainly on solving programming problems.

Teaching methods

Lecture: blackboard and multimedia with elements of hardware experiments

Laboratory: Experiments on laboratory stands, final study of the selected problem

Bibliography

Basic

M. Zwoliński: Projektowanie układów cyfrowych z wykorzystaniem języka VHDL.

K.L.Short, VHDL for engineers

Additional

T . Łuba, B . Zbierzchowski: Komputerowe projektowanie układów cyfrowych.

K.Skahill, VHDL language

J. Kalisz (red.): Język VHDL w praktyce.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classess, preparation for tests) [1]	30	1,0

[1] delete or add other activities as appropriate