COURSE DESCRIPTION CARD - SYLLABUS

Course name
Programmable Digital Circuits [S1Teleinf1>PUC]

Course

Field of study
Teleinformatics

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr hab. inż. Olgierd Stankiewicz
olgierd.stankiewicz@put.poznan.pl

Lecturers

Prerequisites

A student starting this course should have basic knowledge of digital circuit design and digital simulation. Should have the ability to program in c/c++, use integrated environments programming and obtaining information from indicated sources. Should also understand the need to expand his or her competencies. In addition, in terms of social competence the student must present such attitudes as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, respect for other people.

Course objective

Course Objective: 1. To provide students with basic knowledge of digital circuit design in Verilog language. 2. develop in students the ability to solve basic design and implementation problems, in particular to develop the ability to select the optimal system architecture. Developing in students the ability to obtain knowledge about current solutions used in programmable systems.

Course-related learning outcomes

Knowledge:
1. Has knowledge of analysis and synthesis of digital combinatorial and sequential circuits, knows basic digital functional blocks, principles of design of complex digital circuits and their implementation

in programmable digital circuits.
2. Has in-depth knowledge of the structure and operation of ICT systems
for the provision of multimedia services using programmable digital circuits, including processing, compression and transmission of images, sound and speech.
3. Has basic knowledge about the evaluation of the parameters of designed programmable
digital circuits and computer aided design.

Skills:
1. Is able to analyze and design digital combinational and sequential circuits in
Programmable digital circuit technology using appropriate methods and tools
engineering.
2. Is able to plan and run computer simulations and use
programming environments, simulation programs, and tools.

Social competences:
1. The student knows the limits of his knowledge and understands the necessity of its updating. Is open to possibilities of continuous education and improvement of professional, personal and social competences.
2. Has a sense of responsibility for the designed information and communication systems and realizes the social risks in case of inadequate design or execution.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Formative Assessment:
(a) For laboratory exercises:
• Based on an assessment of the ongoing progress of the tasks.
Summative Assessment:
a) in the scope of lectures verification of the assumed educational results is realized by:
• an assessment of the knowledge demonstrated in the examination. The exam consists of answering questions and solving problems.
A minimum score of 50% is required to receive a 3.0; 3.5 - 60%; 4.0 - 70%; 4.5 - 80%
points; 5.0 - 90% points.
b) in the scope of laboratory exercises, verification of the assumed learning outcomes is realized by:
• substantive evaluation of the performance of laboratory tasks,
• continuous evaluation, every class (oral answers),
• grades received on written tests,
• earning extra points for activity during class.

Programme content

Lectures:
Gain the ability to program FPGAs using examples from XILINX, ALTRA/INTEL, and LATTICE.
1. Introduce the group of field programmable circuits (FPGAs), their internal structure and functional characteristics.
2. System-on-Chip (SoC) chips.
3. Testing techniques: "Code Coverage", BIST.
4. FPGAs in embedded systems.
5. Oresentation of hybrid programmable circuits (ARM processor + FPGA matrix)
6. Overview of hardware description languages (HDL).
7. Introduction to the Verilog language.
8. Introduction to the SystemVerilog language.
Laboratories:
The module includes laboratory activities using development boards, during which students create hardware descriptions in Verilog languages. The content of these classes consolidates and extends the knowledge provided during lectures. The end result will be the ability to write, run and test hardware modules on an FPGA.
1. familiarize yourself with and master lLttice's DIAMOND design environment.
2. implement a random number generator in Verilog language.
3. implement a text converter in Verilog language.

4 Create a simple built-in tester (BIST).
5. implementation project of a complex system for measurement and presentation of EMG signal, consisting of: fullHD resolution video signal generator, communication interface circuits (rotary encoder, keyboard, LEDs), ECG analog interface, control system.

Teaching methods

1. Lectures: multimedia presentation, supplemented with current examples and additional explanations on the blackboard.
2. Laboratories: solving tasks, programming.

Bibliography

Basic:
S. Palnitkar, Verilog HDL (2nd Edition), Prentice Hall Professional, 3 mar 2003
M. Pawłowski, A. Skorupski, Design of complex digital circuits, WKiŁ, 2010.

Additional:
J. Bieganowski, G. Wawrzyniak, Verilog language in FPGA

Breakdown of average student's workload

	Hours	ECTS
Total workload	86	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	41	1,00