STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Design of systems with FPGA**		Code **1010842131010842439**
Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **2 / 3**
Elective path/specialty **Multimedia and Consumer Electronics**	Subject offered in: **Polish**	Course (compulsory, elective) **elective**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **1** Classes: **-** Laboratory: **2** Project/seminars: **-**		No. of credits **2**
Status of the course in the study program (Basic, major, other) **other**	(university-wide, from another field) **from field**	
Education areas and fields of science and art **technical sciences**		ECTS distribution (number and %) **2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has a basic knowledge about a trends in the development of FPGA devices. Has sufficient knowledge to design specialized digital circuits for FPGA devices. Has basic knowledge about communication interfaces. Has knowledge about the basic principles of design elements of digital circuits (automatic, streams). Has a general knowledge in area of information theory.
2	**Skills**	Is able find a required information in the literature and other sources, can integrate the information, can interpret them. Can describe the elements of a digital system using the Verilog language. Can test and verify of a digital circuit. Can test and verify a digital modules. Can exploit the known design techniques to design a digital circuit. Has the ability to exploit modern tools of the design and synthesis of digital circuits for FPGA platform.
3	**Social competencies**	Demonstrate responsibility for designed electronic and telecommunication systems

Assumptions and objectives of the course:

Architecture of programmable FPGA programmable hybrid systems (CPU ARM + FPGA matrix). Construction and how to design systems SoC (System-on-Chip). Advanced language features Verilog and SystemVerilog language introduction: advanced simulation methods, compilation and synthesis systems, sample projects selected algorithms.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student has a basic knowledge about hybrid FPGA devices - [K_W_01]
2. Student has a basic knowledge about design SoC systems - [K_W_01]
3. Student has a basic knowledge about fast communication interfaces (HD-SDI, SATA, PCI-E) - [K_W_01]

Skills:

1. Can describe complex digital system as a hierarchy of modules using Verilog language. - [K_U16]
2. Can correctly determine the parameters of the interface between the two frequency domains. - [K_U16]
3. Can acquire data from the literature and other sources, can integrate the information, make their interpretation, as well as formulate and to justify opinions. - [K_U01 K_U02 K_u08]

Social competencies:
1. Can see and analyze development of design techniques - [K_K01]
2. Ability of self-learning (textbooks, computer programs) - [K_K02]
3. Knowing the responsibility for the electronic and telecommunication systems being designed - [K_K03]

Assessment methods of study outcomes
Individual projects, written or oral exam.

Course description
Development and trends in FPGA for example, the latest of programmable FPGA from Xilinx - integrated Artix-7, Kintex-7, Virtex-7, new technologies, "Stacked Silicon Interconnect Technology", "Multi-Gigabit Serial I / O".
Hybrid integrated programmable FPGA - (+ ARM processor programmable matrix).
Frequency domain - the problem of the transmission of data between domains, industrial recommendations, synchronization systems, source synchronous interface.
High Speed ??Interfaces I / O modules with use of gigabit-GTP, GTX, GTH standard HD-SDI, SATA, PCI-E. SerDes circuits in standard HDMI FlatLink.
Systems on a Chip (SoC).
Programming Languages ??- Verilog, VHDL, Systec, SystemVerilog. Principles of good programming, listing just described.
Methods and tools for simulation and synthesis for FPGA designs - generate EDIF files, partition design, TCL scripting language.
Examples of effective implementation of certain algorithms (DCT conversion, color space conversion RGB> YUV, square root, multiplication, complex, floating point operations) for FPGA.

Basic bibliography:

1. Węgrzyn M., Barkalov A.,?Design of Control Units with Programmable Logic?. Zielona Góra 2006.
2. Skahill K., ?Język VHDL?, WNT, Warszawa 2001

Additional bibliography:

1. Woods R. McAllister J., Yi Y. Lightbody G. ?FPGA-based Implementation of Signal Processing Systems?,Wiley,2008.
2. Palnitkar S., ?Verilog HDL (2nd Edition)?, Prentice Hall Professional, 3 mar 2003,
3. Kilts S., ?Advanced FPGA DESIGN?, Wiley 2007.

Result of average student's workload

Activity	Time (working hours)
1. Activities that require personal contact with an academic teacher	90
2. Reading literature (manuals, directories)	15
3. Preparation for the lab	10
4. Preparation for the exam	10

Student's workload

Source of workload	hours	ECTS
Total workload	60	2
Contact hours	45	1
Practical activities	15	1