Bialystok University of Technology									
Field of study	**Computer Science**							**Degree level and programme type**	**Engineer's degree full-time programme**
Specialization/ diploma path	**---**							**Study profile**	academic
Course name	**Digital Circuit Engineering**							**Course code**	**FCS-00056**
								Course type	obligatory
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	**Semester**	2
	30				30			**No. of ECTS credits**	**6**
Entry requirements									
Course objectives	Obtained knowledge: Understanding the principles of operation of digital circuits of small and medium-scale integration. Obtained skills: design of simple digital circuits of small, medium and large scale integration.								
Course content	Information processing. Axioms of Boolean algebra. Logic gates NOT, AND, OR. NAND gate. Classification of digital circuits. Combinational circuits. Truth table. Minimization of logic functions. Karnaugh charts. Realisation of the logic function using logic gates. Minimization of functions with Quine-McCluskey method. Race hazard. Design of multi-output circuits. Standard MSI blocks performing Boolean functions: multiplexer, demultiplexer, decoder, ROM, RAM. The concept of a programmable device. Structures PLD, CPLD and FPGA. Synchronous systems. System clocking. Model of Moore and Mealy machine. Table of transitions and outputs. Minimizing the number of states. Synthesis of synchronous circuits. Encoding states. Flip-flops: D, JK, SR and T. Synthesis of synchronous circuits. The structure of asynchronous circuits. Simple SR Trigger. Synthesis of asynchronous circuits. Master-slave flip-flop. Realization of sequential circuits in the medium and large scale of integration. Functional blocks. Control circuits. Flowchart as a way to describe the control system. Microprogrammed systems. Structure of microprogrammed system. Basic microcodes. Specialist workshop: 1. Getting to know MultiSim and Max + Plus II software. 2. Combinational circuits 3. Testing of combinational circuits 4. Iterative systems 5. Synchronous systems 6. Asynchronous systems 7. Complex systems								
Teaching methods	informative lecture, laboratory exercises, simulation,								
Assessment method	Written exam, reports, short preparation tests								

Symbol of learning outcome	**Learning outcomes**	**Reference to the learning outcomes for the field of study**
LO1	knows the principles of operation of digital circuits	K_W02
LO2	knows the principles of operation of computer components: microprocessors and memory	K_W02
LO3	knows and understands the processes of designing and manufacturing digital circuits and microprocessors	K_W02 K_U02
LO4	is able to comprehensively compare the technologies of production and design solutions od digital circuits and computer technology devices	K_W02
LO5	can design and test a simple digital circuit	K_U02
LO6	is able to formulate a specification of the digital system for a specific application	K_U02

Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	exam	L
LO2	exam	L
LO3	short tests	SW
LO4	exam	L
LO5	report	SW
LO6	report	SW

Student workload (in hours)	**No. of hours**
1 - Attendance at lectures - 15 x 2h =	30
2 - Attendance at specialistic workshop - 15 x 2h =	30
3 - Preparation for specialistic workshop -	15
4 - Participation in student-teacher sessions -	5
5 - Preparation for exam -	20
6 - Preparation of reports -	50
TOTAL:	**150**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	65 (4)+(1)+(2)	2.6
Student workload – practical activities	80 (2)+(6)	3.2

Basic references	1. John F. Wakerly; Digital Design, Principles and Practices, (4th Edition), Pearson/Prentice Hall, 2005. 2. M. Morris Mano, Michael D. Ciletti; Digital Design (4th Edition), Prentice Hall, 2006.
Supplementary references	
Organisational unit conducting the course	Department of Digital Media and Computer Graphics — **Date of issuing the programme**
Author of the programme	dr inż. Wiktor Jakowluk — Feb. 17, 2022

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW – field work,S – seminar