

MODULAR DIGITAL SYSTEMS

Faculty of Computer Science			
Study programme:	Computer Science	Degree level:	Engineer's degree full-time programme
Specialization	---	Diploma path:	2026/2027W - 2026/2027S
Module name:	Modular Digital Systems (Modułowe systemy cyfrowe)		
Module type:	obligatory	Semester: 1	ECTS:3 Module ID:FCS-00107
No. of hrs in semester:	Lecture (L) - 15 Classes(C) - 0 Specialization workshop (SW) - 0 Project (P) - 0 Laboratory classes (LC) - 15 Seminar (S) - 0		
Prerequisites	Foundations of Electrotechnics and Electronics (FCS-00053), Synthesis of Digital Systems (FCS-00106),		
Aims and objectives:	Knowledge of digital electronic components, logic gates and digital circuits made in TTL and CMOS technologies. Understanding the principles of operation: semiconductor memories RAM and ROM, and the construction of programmable logic devices. Knowledge of the AD and DA converters.		
Forms of teaching activities::	lecture, laboratory classes,	Assessment:	Evaluation must be relevant to the intended learning outcomes:
		Lectures - two half tests, specialistic workshop - evaluation of reports, short preparation tests	
Module content:	<p>Lecture: Preparation of active elements on a silicon substrate. MOS and bipolar transistors. Technologies of realisation of TTL and CMOS integrated digital circuits . TTL ICs. NAND gate. Static and dynamic parameters of gates. TTL series chips. MOS digital circuits. NMOS gates. Digital signal transmission through the MOS transistor. CMOS circuits. Dynamic logic. Disadvantages of CMOS circuits. Family of CMOS digital circuits. BiCMOS families digital circuits. Orocess of analog-to-digital conversion. The basic structural components of AD and DA conferters. DACs. ADCs. Construction and operation of SRAM cell. Construction and operation of the DRAM cell. Organization of memory. Timing diagrams. Fast dynamic memory. ROM memory. General organization of ROM memory. Mask ROM, PROM, EPROM, EEPROM, FLASH. Programmable logic devices.</p> <p>Laboratory exercises: 1. Static and dynamic parameters of gates and flip-flops 2. Combinational blocks: multiplexers, demultiplexers and decoders 3. Arithmetic and logic blocks 4. Sequential blocks: registers and counters</p>		
Teaching methods:	laboratory exercises, lecture problem, informative lecture,		
Learning outcomes			
Symbol	Specify min. 4, max. 8 learning outcomes in the following order: knowledge – skills – competence. Each learning outcome must be verifiable	Reference to the programme learning outcomes of education	
L01	knows the principles of operation of digital, analog / digital and digital / analog circuits		
L02	knows the principles of signal processing		
L03	knows the technology and uses different types of digital circuits		
L04	applies the principles of health and safety in the use of electronic devices.		
L05	is able to plan and carry out measurements to determine the characteristics and parameters of electronic circuits. He is able to document the results and analyse them.		
No. of learning outcome	Methods of assessing the learning outcome	Type of teaching activities (if more than one) during which the outcome is assessed	
L01	two tests	L	
L02	two tests	L	
L03	short test allowing attendance at laboratories	Lc	
L04	observation of students during measurement operations	Lc	
L05	report	Lc	
Student's workload (in hours)	1 - attendance at lectures	None	15
	2 - attendance at laboratories	None	15
	3 - preparation for laboratories	None	15
	4 - preparation of reports	None	15
	5 - no English version yet !	None	15
		TOTAL:	
Quantitative indicators	Student's workload - activities that require direct teacher participation: (1)+(2)	30	ECTS 1.2
	Student's workload connected with practical classes (2)+(3)+(4)	45	1.8
Basic references:	<p>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.</p>		

Further reading	1. All about circuits; http://www.allaboutcircuits.com/ , accessible on Internet (access in September 2013).		
Unit:	Department of Digital Media and Computer Graphics	Lecturer/ instructor	dr inż. Wiktor Jakowluk
Date of issuing the programme:	31st March 2026	Author of the programme:	dr inż. Wiktor Jakowluk

L - lecture, C - classes, LC - laboratory classes, P-project, SW - specialization workshop, S - seminar