

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Embedded System Engineering		Code 1010841171010841685
Field of study Electronics and Telecommunications	Profile of study (general academic, practical) general academic	Year /Semester 4 / 7
Elective path/specialty Multimedia and Consumer Electronics	Subject offered in: Polish	Course (compulsory, elective) elective
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 2 Classes: - Laboratory: 1 Project/seminars: -		No. of credits 3
Status of the course in the study program (Basic, major, other) other		(university-wide, from another field) university-wide
Education areas and fields of science and art technical sciences		ECTS distribution (number and %) 3 100%
Responsible for subject / lecturer: dr inż. Adam Łuczak email: aluczak@multimedia.edu.pl tel. +48 6653840 Faculty of Electronics and Telecommunications ul. Piotrowo 3A 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Has knowledge in area of programming in C/C ++. Has a basic knowledge in area of micro-controller programming (AVR/ARM). Has a basic knowledge of controllers and control algorithms.
2	Skills	Is able to look for information required during design process and take educational courses, if needed, especially through Internet and distance education. Can use high-level programming languages ?like ?C/C++. Is able analyze the low-level micro-controller code.
3	Social competencies	Knows the limitations of their own knowledge and skills; can precisely formulate questions; understands the need for further education and systematic reading of scientific journals in the field. Can work individually and in team; knows the responsibility for tasked realized in team.
Assumptions and objectives of the course: Knowledge of the structure and the basic characteristics of embedded systems. Knowledge the three basic implementations of embedded systems (SoC systems, PLCs, programmable circuits). Introduction to interfaces created for embedded systems. Knowledge about a wireless identification technology (RFID).		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student has knowledge about the structure and PLC programming - [K1_W09,K1_W08,K1_W13]		
2. Student knowledge about operation of embedded systems - [K1_W08,K1_W13,K1_W20]		
3. Student has knowledge of the structure and parameters of the communication network (ZigBee, Ant) intended for sensors and detectors - [K1_W08,K1_W13,K1_W20]		
Skills:		
1. Student can design embedded system using SoC (ARM) with respect to the customer requirements - [K1_U14,K1_U21]		
2. Student can run the system SoC based on ARM processor using program libraries and tools for compilation - [K1_U13,K1_U14,K1_U18,K1_U21]		
3. Can define the requirements for the communication link based on the nature and importance of the transmitted data between sensors/detectors and system management - [K1_U14,K1_U15,K1_U21,K1_U23]		
Social competencies:		
1. Can see and analyze development of design techniques - [K1_K01]		
2. Ability of self-learning (textbooks, computer programs) - [K1_K02]		
3. Knowing the responsibility for the electronic and telecommunication systems being designed - [K1_K03]		

Assessment methods of study outcomes		
Individual projects, written exam.		
Course description		
<p>Embedded systems - introduction to the subject matter, historical background, definitions of basic concepts. PLC - construction, functionality, requirements related to the construction drivers. Methods for PLC programming (ladder logic, function block diagram, structured text, instruction list, sequential series of blocks. Embedded ARM-based microcontrollers. Specifications of ARM and SoC systems. Sensors detectors and complex measurement systems. Programmable FPGA devices in embedded systems - areas of application, automotive AEC-Q100 standard, the medical industry, aerospace (resistance to radiation), hardware data encryption, radar applications. Soft-processors for SoC systems in FPGA (MicroBlaze, Nios, LatticeMico). Communication standards in embedded systems - SPI, I2C, 1Wire, CAN, Wireless ZigBee, Ant, Bluetooth, WiFi. Wireless RFID identification.</p>		
Basic bibliography:		
Additional bibliography:		
Result of average student's workload		
Activity	Time (working hours)	
1. Activities that require personal contact with an academic teacher	10	
2. Preparation for laboratory and prepare a report	10	
3. Literature reading (manuals, directories):	10	
4. Preparation for exam	10	
Student's workload		
Source of workload	hours	ECTS
Total workload	90	3
Contact hours	50	2
Practical activities	40	1