

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Design of electronics devices</b>		Code <b>1010811171010833611</b>
Field of study <b>Electronics and Telecommunications</b>	Profile of study (general academic, practical) <b>general academic</b>	Year /Semester <b>4 / 7</b>
Elective path/specialty <b>Radio Communications</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>elective</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>2</b> Classes: <b>1</b> Laboratory: <b>-</b> Project/seminars: <b>-</b>		No. of credits <b>3</b>
Status of the course in the study program (Basic, major, other) <b>major</b>		(university-wide, from another field) <b>from field</b>
Education areas and fields of science and art <b>technical sciences</b> <b>Technical sciences</b>		ECTS distribution (number and %) <b>3 100%</b> <b>3 100%</b>
<b>Responsible for subject / lecturer:</b>  dr inż. Michał Kasznia email: mkasznia@et.put.poznan.pl tel. 61 6653858 Faculty of Electronics and Telecommunications ul. Piotrowo 3A 60-965 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
<b>1</b>	<b>Knowledge</b>	Has a systematic knowledge of mathematical analysis and algebra. (K1_W01) 2. Has a basic, systematic knowledge of physics. (K1_W02) 3. Has a detailed, systematic knowledge of the fundamentals of circuit theory, together with necessary mathematical background. (K1_W05) 4. Has a systematic knowledge, together with necessary mathematical background, of the fundamentals of metrology, which is necessary to measure the signal properties and the parameters of electronic and telecommunication systems components. Has knowledge of measurement methods, measurement equipment. (K1_W18)
<b>2</b>	<b>Skills</b>	1. Is able to extract information from literature and other sources. Is able to synthesize gathered information, draw conclusions and justify opinions. (K1_U01) 2. Demonstrates the ability to solve basic problems in physics. (K1_08) 3. Demonstrates the ability to solve typical tasks and problems related to analysis of electrical circuits. (K1_09) 4. Is able to measure typical parameters of signals, systems and devices. Is able to choose appropriate methods to measure given electrical quantities and parameters of signals and devices. Is able to plan and perform measurements and analyze the results. (K1_U17)
<b>3</b>	<b>Social competencies</b>	1. Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study. (K1_K01) 2. Is able to participate in collaborative projects. (K1_K02)
<b>Assumptions and objectives of the course:</b> To provide students with a methodical approach to electronics devices design. The aim is to present and instill the principles of design techniques and a prototype construction. To enable students to understand and appreciate the underlying technology associated with the thermal management testing, electromagnetic compatibility, inspection, failure analysis of electronics products.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b> 1. Has a wide, systematic knowledge of the properties and characteristics of electronic components, as well as of construction, analysis and design of electronic circuits. - [K1_W08] 2. Knows and understands basic concepts and methods of description of linear and non-linear electronic systems. - [K1_W10] 3. Has knowledge of devices and systems exploitation. - [K1_W20]		
<b>Skills:</b>		

1. Is able to extract information from literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions. - [K1_U01]
2. Is able to prepare a well-documented study on problems related to electronics and telecommunication. - [K1_U03]
3. Is capable of studying autonomously. - [K1_U05]
4. Is able to use catalogues, find required information from application notes of semiconductor elements and electronic circuits, select appropriate elements and electronic circuits. Is able to identify a problem and formulate a design specification of a simple analogue electronic circuit. Is able to design and implement a simple analogue electronic circuit. - [K1_U12]
5. Is able to analyze, design and build electronic circuits, using appropriate methods and engineering tools, and taking into consideration predefined criteria. Is able to use models, catalogue cards and application notes of semiconductor electronic elements. Is able to analyze and design circuits and systems using CAD. - [K1_U16]
6. Is able to select the construction of devices according to technical requirements and service conditions. - [K1_U21]
<b>Social competencies:</b>
1. Demonstrates responsibility and professionalism in solving technical problems. - [K1_K02]
2. Demonstrates responsibility for designed electronic and telecommunication systems. Is aware of the hazards they pose for individuals and communities if they are improperly designed or produced. - [K1_K03]
3. Is aware of the main challenges facing electronics and telecommunication in the 21st century. - [K1_K04]

<b>Assessment methods of study outcomes</b>		
- Written tests from content of the lectures and classes.		
- Activity during classes.		
<b>Course description</b>		
- Organisation of the process of design of electronic circuits, a description of each stage, the principles of drafting and documentation flow, computer-aided design methods.		
- Legal aspects of electronic design: Polish technical standards, European technical standards, other regulations.		
- The physical principles of operation of electronic components and their design technologies.		
- Electric and electronic components, the basic parameters and characteristics, description, devices packages.		
- Implementation stages of the electronic device prototype: the rules drawing of diagrams, the principles of correct placement of components, computer methods for PCB design, PCB manufacturing technologies, soldering technologies, testing of printed circuit boards.		
- Basic problems of the implementation of printed circuit boards: selection of laminate materials, soldering, power supply decoupling, shielding, design for manufacturability.		
- Diagnostics and testing of electronic devices: classification and sources of damage, tolerance area, design for testability.		
- Electromagnetic compatibility: transmission lines in a PCB, impedance control, signal integrity, routing and termination, decoupling.		
- Types of documentations: engineering documentation, PCB documentation, product documentation, service documentation.		
<b>Basic bibliography:</b>		
1. Rymarski Z., Materiałoznawstwo i konstrukcja urządzeń elektronicznych, Wydawnictwo Politechniki Śląskiej, Gliwice 2000.		
2. Kisiel R., Podstawy technologii dla elektroników, Poradnik praktyczny, Wydawnictwo BTC, 2005.		
3. Horowitz P., Hill W., Sztuka elektroniki, cz. 1 i 2, WKiŁ, Warszawa 2009.		
4. Rutkowski J., Słownikowe metody diagnostyczne analogowych układów elektronicznych, WKiŁ, Warszawa 2011.		
<b>Additional bibliography:</b>		
1. Praca zbiorowa, red. Tadeusz Łuba, Programowalne układy przetwarzania sygnałów i informacji, WKiŁ, Warszawa 2011.		
2. Kulka Z., Nadachowski M., Analogowe układy scalone, WKiŁ, Warszawa, 1985.		
3. Gołda A., Kos A., Projektowanie układów scalonych CMOS, WKiŁ, Warszawa 2010.		
<b>Result of average student's workload</b>		
<b>Activity</b>	<b>Time (working hours)</b>	
1. Participation in lectures and classes	45	
2. Preparation for classes	15	
3. Individual work with literature	10	
4. Preparation to the tests	10	
<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	75	3

Contact hours	50	2
Practical activities	30	1