STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Electronics**		Code **1010641171010830427**
Field of study **Mechanical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **4 / 7**
Elective path/specialty **Mechatronics**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
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) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art		ECTS distribution (number and %)

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	1. Students have a basic knowledge of physics. 2. Students have a knowledge of the fundamentals electrical engineering, together with necessary mathematical background; this knowledge allows them to understand, analyze and evaluate the operation of electrical circuits.
2	**Skills**	1. Students know how to use instruments like digital multimeters, signal oscillators and digital oscilloscopes. 2. Students are able to create and to run a software in C+ or C++ language. 3. Students are capable of studying autonomously. 3. Demonstrates the ability to solve basic problems in physics. 4. Demonstrates the ability to solve typical tasks and problems related to analysis of electrical circuits. 5. Can implement the occupational health and safety principles.
3	**Social competencies**	1. Students know limitations of their current knowledge and skills; they committed to further self-study. 2. They are able to participate in collaborative projects.

Assumptions and objectives of the course:

1. To learn a structure of a computer-based measurement system and its components.
2. To know the limits of a measurement accuracy and of a measurement resolutiont.
3. To learn most frequently used interface standards for measurement systems with serial or paralel data transmission.
4. To learn commonly used programming languages: LabVIEW and VEE.
5. To learn some examples of computer-based measurement systems.

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

Knowledge:

1. Students got knowledge of a structure of a measurement systems and its components - [K1A_W14]
2. Students got knowledge of measuremnt limits (accuracy, resolution) of particular physical quantities - [-]
3. Students know principles of analog to digital conversion and digital to analog copnversot of voltage - [-]
4. Students know most important standards of interface for measurement systems with serial data transfer (RS232, RS485, LAN, CAN). - [-]
5. Students know most important standards of interface for measurement systems with parallel data transfer: IEEE488 - [-]
6. Students know important standards of wireless interface for measurement systems (GSM, Bluetooth, ZigBee) - [-]
7. Students know the sstructure of a virtual instrument and know its performances - [-]
8. Students know economical limits and of activity of experts in control and measurement systems - [-]

Skills:

1. Students are able to extract information from Polish or English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions - [K1A_U16]
2. Students are able to prepare a well-documented study, in English or in Polish, on problems related to electronics and telecommunication - [-]
3. Students are capable of studying autonomously - [-]
4. Students are able to measure typical parameters of signals, systems and devices, in particular those used in telecommunication. 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 - [K1A_U16]

Social competencies:

1. Demonstrates responsibility and professionalism in solving technical problems - [K1A_K04]
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 - [-]
3. Is aware of the main challenges facing electronics and telecommunication in the 21st century - [-]

Assessment methods of study outcomes

-Lectures passing based on written test from content of the lectures.
-Tests in laboratory.
-Reports from laboratory experiments.

Course description

1. P-n junction. Junction diode. 2. Diode in rectifier circuits. 3. Zener diode. 4. Bipolar transistor. Effect of amplification of current. 5. Transistor amplifier with negative emitter feedback. 6.Wtórnik emiterowy. 7. Field effect transistor (FET): construction and characteristics . Voltage amplification effect. 8. Amplifiers with JFET transistors. 9. MOSFET transistors. 10. Voltage amplifiers with operational amplifiers (opamps). 11. Integrators and differentional circuits. 12. Conditions for oscillations. 13. Sin-form oscillator with the Wien bridge. 14. Oscillators with LC resonant circuits. 15. Transistor flip-flop as an oscillator. 16. RC active filters: types, characteristics, diagrams. 17. De Morgan laws in the Boole albegra. Logic operation of AND and OR function using NAND or NOR gates. 18. Flip-flops of D and JK. 19. Pulse counter with D and JK flip-flops. 20. Digital to analog converters. 21. Analog to digital converters: a flash converter, a dual slope concerter.

Basic bibliography:

Additional bibliography:

Result of average student's workload

Activity	Time (working hours)
1. Participation In lectures	30
2. Consultings of the course	2
3. Preparing for exam	10
4. Exam	2
5. Experiments In laboratory	15
6. Preparing for experiments	7
7. Preparing for laboratory tests	6
8. Test In laboratoru	2

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	74	3
Contact hours	57	2
Practical activities	28	1