



Subject card

Subject name and code	Electrical Engineering, PG_00033413						
Field of study	Mechatronics, Mechatronics						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2020/2021		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Control Systems Engineering -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Mirosław Mizan, doc. PG					
	Teachers	dr inż. Mirosław Mizan, doc. PG dr hab. inż. Leszek Jarzębowicz dr inż. Sławomir Judek					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	15.0	0.0	0.0	45
	E-learning hours included: 0.0						
Adresy na platformie eNauczanie: Elektrotechnika dla kier. Mechatronika I stopień sem. 2 - Moodle ID: 6256 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=6256							
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study	SUM	
	Number of study hours	45	5.0		25.0	75	
Subject objectives	The aim is to explain the fundamental laws of the electrical phenomena and to acquaint students with the basic principle of operation of electrical equipment. Teaching the methods of the analysis of simple electrical circuits.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K6_W10	The student defines the basic physical quantities in electric circuits. Explains the law describing the relationship between physical quantities in electric circuits. Calculates the value of the currents, voltages and power in the electrical circuit elements. Explains the basic principles of operation of electrical machines and electrical equipment. Uses basic electrical equipment used in industry. Performs basic measurements of electrical quantities. Uses a modern electric drive systems. Recognizes the importance of self-expanding knowledge and skills in the field of study and related areas. Combines knowledge from various fields.	[SW1] Assessment of factual knowledge
	K6_U04	The student defines the basic physical quantities in electric circuits. Explains the law describing the relationship between physical quantities in electric circuits. Calculates the value of the currents, voltages and power in the electrical circuit elements. Explains the basic principles of operation of electrical machines and electrical equipment. Uses basic electrical equipment used in industry. Performs basic measurements of electrical quantities. Uses a modern electric drive systems. Recognizes the importance of self-expanding knowledge and skills in the field of study and related areas. Combines knowledge from various fields.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
Subject contents	<p>Lecture: The basic physical quantities in electrical engineering. Electrical circuit elements and their characteristics. Kirchhoff's laws. Measurements of electrical and non-electrical quantities by electrical methods. Nonlinear circuits - basic properties. Single-phase AC linear circuits, the current-voltage relations for the resistor, coil and capacitor. Method of complex amplitudes for calculation of currents and voltages in AC circuits. Powers in AC circuits. The phenomenon of resonance in electrical circuit. Three-phase AC circuit - the basic formulas, power measurement. Electric and magnetic field, forces in the electromagnetic field. The Faraday's law of electromagnetic induction. Transformer - the physical phenomena and principles of operation, the basic equations. Rotating electrical machines - motor and generator. Electric DC motors - principles of operation, velocity control. Three-phase AC motors: induction-, synchronous-, permanent magnet motor and their control. The structure of the drive system. Semiconductor electronics components: diode, transistor, thyristor. Power electronic converters in the drive system: rectifier, chopper, inverter. Systems of protection against electric shock. Tutorials: Electrical circuit elements and their characteristics. Kirchhoff's laws. Basic methods of analysis of linear DC circuits. Nonlinear circuits: Determination of bias point of non-linear element. Single-phase linear AC circuits - the complex amplitudes method for analysis of the AC circuits. Calculation of power in the sinusoidal alternating current circuits. Determination of resonant frequencies in the electrical circuit. Symmetrical three-phase AC circuits - examples of the calculation. Analysis of circuits with the transformer. Determination of parameters in a simple drive system based on the electric motor, the selection of circuit elements. Laboratory: Linear and nonlinear DC circuits - the supply and load elements, measurements of electrical quantities, voltage-current characteristics of the elements. AC circuits - basic elements, measurements of power, current and voltage, setting the parameters. Small power transformer - voltage-current dependence, determination of parameters. The drive system of DC motor - methods of speed and torque control. The drive system with asynchron motor - start-up, speed control. Servodrive with permanent magnet synchronous motor - position, velocity and torque control. Microprocessor controllers in drive systems.</p>		
Prerequisites and co-requisites	Basic knowledge in mathematics and physics at secondary level.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	50.0%	40.0%
	Test on the content of lectures	50.0%	20.0%
	Practical exercise	50.0%	40.0%
Recommended reading	Basic literature	<p>1. Pr. zb. : Elektrotechnika i elektronika dla niefizyków. Podręcznik akademicki Mechanika. WNT, Warszawa 2004 2. Kurdziel R.: Podstawy Elektrotechniki. WNT, Warszawa 1972 3. Zawalich E., Zawalich J.: Elektrotechnika dla mechaników zadania. Wyd. PG, Gdańsk 2003 4. Horiszny J., Aftyka W., Tiliouine H., Mizan M.: Obwody elektryczne w stanach ustalonych. Zbiór zadań. Wyd. PG, Gdańsk 2004. 5. Instrukcje laboratoryjne.</p>	

	Supplementary literature	1. Pr. zb.: Poradnik Inżyniera Elektryka. T.1-3. WNT, Warszawa 1996. 2. Matulewicz W.: Maszyny elektryczne podstawy. Wyd. PG, Gdańsk 2005.
	eResources addresses	Elektrotechnika dla kier. Mechatronika I stopień sem. 2 - Moodle ID: 6256 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=6256
Example issues/ example questions/ tasks being completed	The calculation of the currents in the DC circuit. Calculation of currents in the AC circuit. Calculation of the power of circuit components. The adjustment of the circuit parameters to achieve a specific desired value of the given output parameter of the circuit. The calculation of currents and voltages in a circuit with the loads of the given nominal values. The calculation of currents and voltages in a circuit with a transformer. Calculate the current in the symmetrical 3-phase circuit.	
Work placement	Not applicable	