



Subject card

Subject name and code	Electrotechnics and electronics, PG_00044580						
Field of study	Transport						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2021/2022		
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	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Electrical Engineering of Transport -> Faculty of Electrical and Control Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Krzysztof Karwowski					
	Teachers	dr inż. Sławomir Judek dr hab. inż. Krzysztof Karwowski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	45.0	15.0	15.0	0.0	0.0	75
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie: ELEKTROTECHNIKA I ELEKTRONIKA (PG_00044580) - Moodle ID: 20390 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=20390						
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	75	5.0		20.0		100
Subject objectives	Students is able to solve simple DC circuits and AC circuits, both single phase and three phase. Student is able to interpret the parameters of electrical equipment. Characterized electrical devices. Student is able to perform simple measurements of voltage, current and power of DC/AC circuits. Interpret the results of the measurements. Distinguished between analog and digital electronic and telecommunications devices.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W04] has basic knowledge of informatics, electronics, telecommunications, automation and control, information technologies, computer graphics, geodesy and satellite navigation which is useful for understanding how it can be applied in transport	Student has a basic knowledge on electrical engineering. Student is able to characterize selected electrical equipment. Student is able to characterize electronic and telecommunications equipment. Student is able to plan and perform simple measurements of electrical quantities.			[SW1] Assessment of factual knowledge		
	[K6_W03] has basic knowledge of hydromechanics, thermodynamics, machine design, materials science and electrical engineering required for understanding the principles of construction and operation of means of transport	Student is able to use the terms related to electrified transport infrastructure and vehicles.			[SW1] Assessment of factual knowledge		
	[K6_U01] able to use technical documentation and literature, databases and other sources of transport related information; able to interpret information, make logical links and formulate opinions and conclusions based on the above	Students can use the technical documentation of electrical engineering. Student is able to look for and interpret new developments in the technical literature.			[SU2] Assessment of ability to analyse information		

Subject contents	LECTURE Classification of electric signals and elements of electric circuits. Direct current linear electric circuits. Ohm's, and Kirchhoff's law. Electric power and energy. The methods of electric circuits solutions: similarity method, node method and Thevenin method. DC non-linear electric circuits. Linearized circuit in bias point. Alternating current (AC) linear electric circuits. Method of determining of voltage and current waveforms on the resistance, inductance and capacitance. Complex numbers method. Phasor diagrams. Power in AC circuit. Method of solution of AC circuits: similarity method, node method. Phenomena of resonance - the resonant frequency. Three-phase electric circuits. Compensation of reactive power and voltage in power electrical systems. Electric and magnetic field. Sources of electricity. Magnetic coupling circuits. Transformers. Basic concepts of rotating machines. DC and Induction machines. Motor speed control. Power electronics in modern electrical engineering. Power switching devices. Review of standard power electronic circuits – converters and inverters. Electric installations. Low-voltage distribution circuit diagrams. Electrical safety. Protection in low voltage installations. Elements of electronics. Constructions and characteristics of semiconductor devices. Diodes. Transistors. Optoelectronics elements. Active circuits with operational amplifier. Amplifiers. Generators. Power supplies. Introduction to logic circuits. Introduction to microprocessors. Representation of numbers. Selected applications of microprocessors. The transmission of signals, types of transmission channels. Protocols and networks. TUTORIALS DC circuits. Power in DC circuit, matching the source to the load. Kirchhoff method. AC circuits. Representation of the waveforms using complex numbers. The concept of impedance, reactance, equivalent circuit method. The concept of power in AC circuits. Active power, reactive and apparent power, power factor of the system. Calculation of the current drawn from the mains supply mixed group of receivers. Symmetrical three-phase circuits, basic concepts: line and phase voltage, line and phase currents for the receivers connected in a star or a delta. The concept of three-phase power system. Simplified one-wire diagrams: SEE, transformer, receiver. Operational amplifier circuits. LABORATORY Resonant circuits. Transformer. Multi-pulse rectifiers. AC and DC electric drive. Operational amplifier circuits. Optoelectronics. Electrical installations and equipment.														
Prerequisites and co-requisites	Basic knowledge on mathematics and physics.														
Assessment methods and criteria	<table border="1" data-bbox="448 712 1498 857"> <thead> <tr> <th data-bbox="448 712 794 757">Subject passing criteria</th> <th data-bbox="794 712 1141 757">Passing threshold</th> <th data-bbox="1141 712 1498 757">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 757 794 790">Practical exercise</td> <td data-bbox="794 757 1141 790">60.0%</td> <td data-bbox="1141 757 1498 790">20.0%</td> </tr> <tr> <td data-bbox="448 790 794 824">Exam</td> <td data-bbox="794 790 1141 824">60.0%</td> <td data-bbox="1141 790 1498 824">60.0%</td> </tr> <tr> <td data-bbox="448 824 794 857">Report from laboratory exercises</td> <td data-bbox="794 824 1141 857">60.0%</td> <td data-bbox="1141 824 1498 857">20.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Practical exercise	60.0%	20.0%	Exam	60.0%	60.0%	Report from laboratory exercises	60.0%	20.0%
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Recommended reading	Basic literature	Bołkowski S.: Teoria obwodów elektrycznych. Warszawa: WNT, 2007. Bołkowski S., Brociek W., Rawa H.: Teoria obwodów elektrycznych. Zadania. Warszawa: WNT, 2007. Pr. zb. : Elektrotechnika i elektronika dla nieelektryków. Warszawa: WNT, 2007. Tietze U. Schenk Ch.: Układy półprzewodnikowe. Warszawa: WNT, 2009. Rusek M., Pasierbiński J.: Elementy i układy elektroniczne w pytaniach i odpowiedziach. Warszawa: WNT, 2006.													
	Supplementary literature	Judek S., Karwowski K.: Elektrotechnika, elektronika i telekomunikacja. Zbiór zadań wraz z wybranymi rozwiązaniami. (internal publication). Judek S., Karwowski K., Karkosiński D., Mizan M.: Elektrotechnika, elektronika i telekomunikacja. Instrukcje do laboratorium (internal publication).													
	eResources addresses	ELEKTROTECHNIKA I ELEKTRONIKA (PG_00044580) - Moodle ID: 20390 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=20390													
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Draw simple examples of electrical circuits DC and AC, and discuss ways to determine their parameters. 2. Discuss the construction of DC and AC motors and show the ways to adjust the angular velocity. 3. Characterize the electrical supply installations. 4. Characterize electronic and power electronics components. 5. Discuss methods of serial communications of signals. 														
Work placement	Not applicable														