



Subject card

Subject name and code	Electrical engineering and electronics, PG_00064268						
Field of study	Transport						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
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 Electrified Transportation -> Faculty of Electrical and Control Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Sławomir Judek				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	15.0	0.0	0.0	60
	E-learning hours included: 0.0						
	eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=1478						
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	60		4.0		36.0	100
Subject objectives	The student demonstrates the ability to solve basic DC and AC circuits, encompassing single-phase and three-phase configurations. They possess the skill to interpret electrical equipment parameters. They can characterize electrical devices and installations and understand the operational principles of electrical drives. The student is competent in conducting simple measurements of voltage, current, and power in DC and AC circuits, and can interpret the resulting data. They can differentiate between analog and digital electronic devices.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_W02] has knowledge of physics, mechanics, electrical engineering, hydromechanics, thermodynamics, materials science, and measurement techniques necessary to understand the phenomena occurring in transportation, as well as the principles of construction and operation of infrastructure and means of transport		The student has basic knowledge of electrical engineering. A student can characterize selected electrical equipment. Students can characterize electronic equipment. Students can plan and perform simple measurements of electrical quantities.		[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. The student can identify and interpret new developments in the technical literature.		[SU2] Assessment of ability to analyse information		

Subject contents	Course content – lecture		
	Classification of electric signals and elements of electric circuits. Direct current linear electric circuits. Ohms, and Kirchhoffs 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 the 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 an 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 electrical power 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 an operational amplifier. Amplifiers. Generators. Power supplies. Introduction to logic circuits. Introduction to microprocessors. Representation of numbers. Selected applications of microprocessors.		
	Course content – exercises		
	DC circuits. Power in a 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 wye or delta. The concept of a three-phase power system. Simplified one-wire diagrams: SEE, transformer, receiver. Operational amplifier (op-amp) circuits. Binary system and arithmetic.		
Prerequisites and co-requisites	Course content – laboratory		
	Resonant circuits. Transformer. Multi-pulse rectifiers. AC and DC electric drive. Operational amplifier circuits. Optoelectronics. Electrical installations. Electrical devices: overcurrent circuit breaker and differential circuit breaker.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	60.0%	60.0%
	Tests	60.0%	20.0%
	Report from laboratory exercises	60.0%	20.0%
Recommended reading	Basic literature	Charles K. Alexander, Matthew N. O. Sadiku: Fundamentals of electric circuits. 5th ed. McGraw-Hill Science Engineering, 2012	
	Supplementary literature	Karris S. T.: Circuit Analysis I with MATLAB Applications. Orchard Publications 2004	
		Karris S. T.: Circuit Analysis II with MATLAB Applications. Orchard Publications 2003	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. Draw simple examples of electrical DC and AC circuits, 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.		
Practical activities within the subject	Not applicable		

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